EOSDIS Core System Project

ECS Project Training Material
Volume 10: Archive Processing

December 1997

Hughes Information Technology Systems
Upper Marlboro, Maryland

ECS Project Training Material
Volume 10: Archive Processing

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Preface

This document is a contract deliverable with an approval code of 3. As such, it does not require formal Government approval. This document is delivered for information only, but is subject to approval as meeting contractual requirements.

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Abstract

This is Volume 10 of a series of lessons containing the training material for Version 2 Drop 2 of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS). This lesson provides a detailed description of the process required to perform the tasks associated with archive functions.

Keywords: training, archive, AMASS, course objective

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Introduction

Identification

Training Material Volume 10 is part of Contract Data Requirements List (CDRL) Item 129, whose requirements are specified in Data Item Description (DID) 625/OP3 and is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-6000).

Scope

Training Material Volume 10 describes the process and procedures associated with Archive Processing. It describes archive hardware, software, and data. In addition, it addresses starting and shutting down the tape archive control software, monitoring archive requests, and performing archive management tasks. This lesson is designed to provide the operations staff with sufficient knowledge and information to satisfy all lesson objectives.

Purpose

The purpose of this Student Guide is to provide a detailed course of instruction that forms the basis for understanding data archiving. Lesson objectives are developed and will be used to guide the flow of instruction for this lesson. The lesson objectives will serve as the basis for verifying that all lesson topics are contained within this Student Guide and slide presentation material.

Status and Schedule

This lesson module provides detailed information about training for Version 2.0, Drop 2. Subsequent revisions will be submitted as needed.

Organization

This document is organized as follows:

Introduction:	The Introduction presents the document identification, scope, purpose, and organization.
Related Documentation:	Related Documentation identifies parent, applicable and information documents associated with this document.
Student Guide:	The Student Guide identifies the core elements of this lesson. All Lesson Objectives and associated topics is included.
Slide Presentation:	Slide Presentation is reserved for all slides used by the instructor during the presentation of this lesson.

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Related Documentation

Parent Document

The parent document is the document from which this ECS Training Material's scope and content are derived.

423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work

Applicable Documents

The following documents are referenced within this ECS Training Material, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document:

420-05-03	Goddard Space Flight Center, Earth Observing System (EOS) Performance Assurance Requirements for the EOSDIS Core System (ECS)
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

Information Documents

Information Documents Referenced

The following documents are referenced herein and amplify or clarify the information presented in this document. These documents are not binding on the content of the ECS Training Material.

535-TIP-CPT-001	Goddard Space Flight Center, Mission Operations and Data Systems Directorate (MO&DSD) Technical Information Program Networks Technical Training Facility, Contractor-Provided Training Specification
609-CD-003-001	Operations Tools Manual for the ECS Project
611-CD-004-001	Mission Operations Procedures for the ECS Project

Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of the ECS Training Material.

220-TP-001-001	Operations Scenarios - ECS Release B.0 Impacts, Technical Paper for the ECS Project

305-CD-020-002	Release B SDPS/CSMS System Design Specification Overview for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification for the ECS Project
305-CD-022-002	Release B SDPS Interoperability Subsystem Design Specification for the ECS Project
305-CD-023-002	Release B SDPS Data Management Subsystem Design Specification for the ECS Project
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-026-002	Release B SDPS Planning Subsystem Design Specification for the ECS Project
305-CD-027-002	Release B SDPS Data Processing Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS System Management Subsystem Design Specification for the ECS Project
305-CD-030-002	Release B GSFC DAAC Design Specification for the ECS Project
305-CD-031-002	Release B Langley DAAC Design Specification for the ECS Project
305-CD-033-002	Release B EDC DAAC Design Specification for the ECS Project
305-CD-034-002	Release B ASF DAAC Design Specification for the ECS Project
305-CD-035-002	Release B NSIDC DAAC Design Specification for the ECS Project
305-CD-036-002	Release B JPL PO.DAAC Design Specification for the ECS Project
305-CD-037-002	Release B ORNL DAAC Design Specification for the ECS Project
305-CD-038-002	Release B System Monitoring and Coordination Center Design Specification for the ECS Project
305-CD-039-002	Release B Data Dictionary Subsystem Design Specification for the ECS Project
601-CD-001-004	Maintenance and Operations Management Plan for the ECS Project

604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- ECS Release B
605-CD-002-001	Release B SDPS/CSMS Operations Scenarios for the ECS Project
607-CD-001-002	ECS Maintenance and Operations Position Descriptions
500-1002	Goddard Space Flight Center, Network and Mission Operations Support (NMOS) Certification Program, 1/90

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Archive Processing

Lesson Overview

This lesson reviews the process of archiving data, including a description of processing for monitoring the ingest/archival/distribution performance, maintaining configuration of peripherals and data servers, documenting archive errors, maintaining the archive processing queue (storage and retrieval), managing archive content and capacity, submitting new data archive requests to the Science Coordinator, and providing archive status.

Lesson Objectives

Overall Objective - The overall objective of this lesson is proficiency in the methodology and procedures for archive processing in the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) during maintenance and operations. The lesson includes a description of processing for monitoring the ingest/archival/distribution performance, maintaining configuration of peripherals and data servers, documenting archive errors, maintaining the archive processing queue (both storing and retrieval), managing archive content and capacity, submitting new data archive requests to the Science Coordinator, and providing archive status.

Enabling Objective 1 - The student will list DAAC operator positions for Archive Manager personnel interfaces and identify responsibilities associated with each interface.

Condition - The student will be given a list of DAAC operators.

Standard - The student will select four personnel positions with which the Archive Manager interfaces and list at least one major area of responsibility for each selected position.

Enabling Objective 2 - The student will identify two major hardware facilities for archival storage and their associated storage cartridges.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, a working system archive facility, an EMASS tape cartridge, a D-3 tape cartridge, and an optical cartridge.

Standard - The student will correctly point out the EMASS Automated Media Library (AML) and its associated tape and optical cartridges, and correctly point out the StorageTek Library Storage Module (LSM) and its associated D-3 cartridge.

Enabling Objective 3 - The student will describe the File Storage Management System (FSMS) software.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project* and a copy of 609-CD-003-001 *Operations Tools Manual*.

Standard - The student will identify the FSMS software as the Archival Management and Storage System (AMASS), correctly describe AMASS by stating its nature as a UNIX file system installed on an SGI XL computer, and state the five steps in the AMASS control path without error.

Enabling Objective 4 - The student will start the AMASS tape archive system.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will operate the EMASS AML control panel and, if applicable, the STK control panels, power up the archive hardware, and then boot AMASS host and start AMASS without error.

Enabling Objective 5 - The student will shut down the AMASS tape archive system.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility with AMASS started.

Standard - The student will terminate AMASS and shut down the AMU without error.

Enabling Objective 6 - The student will use manual mode to enter the AML.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility with AMASS started.

Standard - The student will switch from automatic to manual mode, enter the AML, leave the AML, and switch back to automatic mode, without error and following all required safety precautions.

Enabling Objective 7 - The student will describe the process of, and monitor the progress of, inserting new data into the archive.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will describe without error the process of inserting new data into the archive.

Enabling Objective 8 - The student will launch available Data Server Subsystem (DSS) Graphical User Interfaces (GUIs) and monitor retrieval of data from the archive.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures relating to monitoring retrieval of data from the archive.

Enabling Objective 9 - The student will perform automatic and manual loading of archive storage cartridges.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, a working system archive facility, EMASS tape cartridges, D-3 tape cartridges, and optical cartridges.

Standard - The student will perform procedures for automatic and manual loading of the proper cartridges for the AML and LSM without error.

Enabling Objective 10 - The student will create a backup for AMASS.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will correctly use the *vgexport -q* command to create the AMASS backup.

Enabling Objective 11 - The student will replace a full Backup Volume.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures for replacing the Backup Volume (Volume 1).

Enabling Objective 12 - The student will manually create a replacement backup for an archive data tape.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedures for manually creating a replacement backup for an archive data tape.

Enabling Objective 13 - The student will "restore" archive data by inserting a backup copy cartridge.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for inserting a backup copy cartridge to replace a lost archive data tape.

Enabling Objective 14 - The student will use the *quedisplay* command to display what is in the AMASS queue.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for viewing what is in the AMASS queue.

Enabling Objective 15 - The student will use the *amass_log* script to display AMASS errors.

Condition - The student will be given a copy of 611-CD-004-001 *Mission Operation Procedures for the ECS Project*, 609-CD-003-001 *Operations Tools Manual*, and a working system archive facility.

Standard - The student will perform without error the procedure for using the *amass_log* script to display AMASS messages from the system log file.

Importance

The Archive Manager's role in maintaining the archive data is key to the successful implementation and operation of ECS. Ensuring the smooth operation of the archive is crucial for ECS core functionality.

Overview of Archive Processing

Archive processing is at the heart of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) at the Distributed Active Archive Centers (DAACs). Through archive processing, data that have been ingested into the system are archived to tape or disk for permanent storage and distributed to users via hard media (tape or disk) or electronic means.

The Archive Manager's job entails working with the Science Data Specialist, the Science Coordinator, and the Resource Manager, as well as providing direction for the Data Ingest Technician. These personnel interfaces are illustrated in Figure 1.

The Data Server Subsystem (DSS) is responsible for storing earth science and related data in a persistent fashion, providing search and retrieval access to this data, and supporting the administration of the data, hardware devices, and software products. As part of its retrieval function, the subsystem also provides for distribution of data electronically or on physical media.
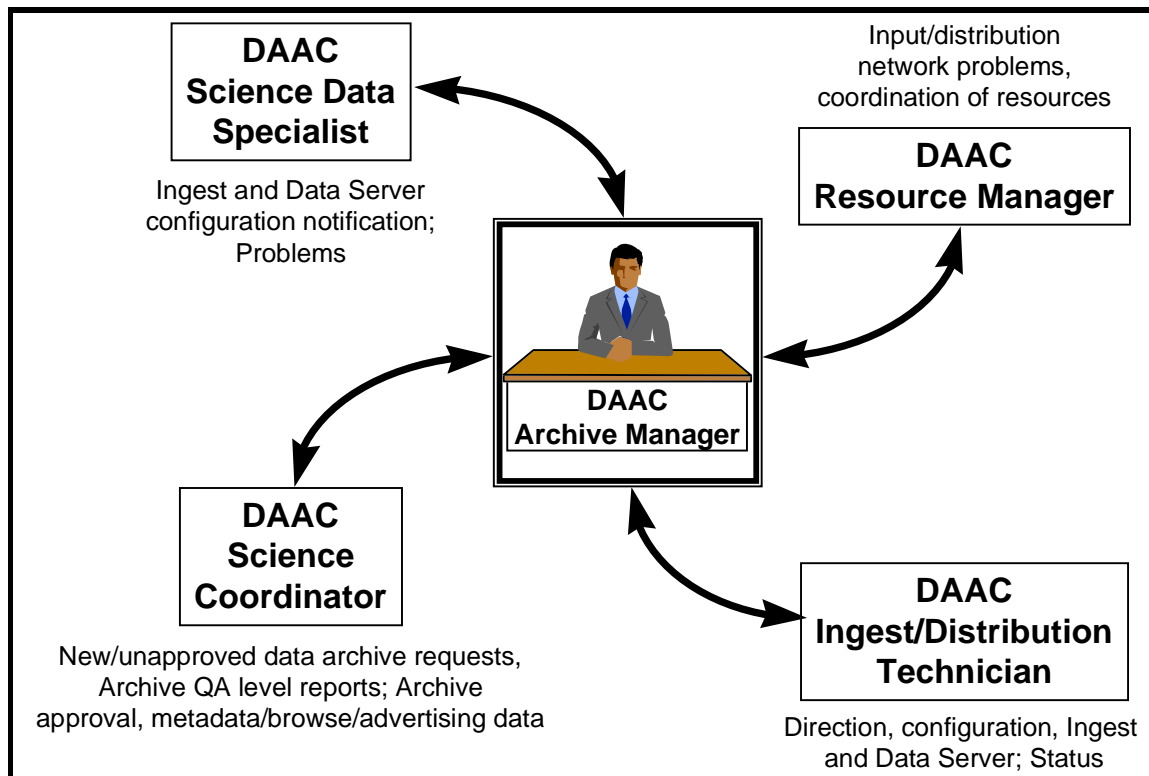

Figure 1. Archive Manager Personnel Interfaces

Hardware

The ECS Archive uses two major types of storage hardware. The E-Systems Modular Automated Storage Systems (EMASS), an example of which is illustrated in Figure 2, is a mass storage system of removable media jukeboxes. At GSFC, LaRC, and EDC, additional larger storage capability is provided through the StorageTek (STK) Powderhorn tape storage tower, illustrated in Figure 3. The host computer for the software that manages the storage in the ECS architecture is a Silicon Graphics Inc. (SGI) Challenge XL while the most prevalent tape archive in ECS is the EMASS Model AML/2,

Figure 2. EMASS Automated Media Library (AML)

Figure 3. StorageTek (STK) Powderhorn Library Storage Module (LSM)

The EMASS Automated Media Library (AML) consists of the following major parts:

- Automated Management Unit (AMU), which is an IBM OS/2 microcomputer controller for the AML.
- Entry Interface Facility (EIF), where media are inserted or ejected from the AML.
- Quadio and sub-towers which make up a multilevel turntable that stores the media.
- tape drives and optical drives.
- the "robot" which takes the media from the tower (called a "keep") to a tape drive (called a "mount") and from the tape drive to the tower.

The STK Library Storage Module (LSM) is similar in concept, but it uses D-3 tape cartridges for storage. These may be inserted or ejected through the Cartridge Access Port (CAP).

The EMASS AML tape archive can store thousands of tapes and optical media, each tape capable of storing 10 - 30 gigabytes of data and each optical media unit capable of storing 2.6 - 5.2 gigabytes of data. Thus, the total storage capacity of the AML archive is in the petabyte range (quadrillions of bytes). The STK LSM can store thousands of D-3 tapes, each holding 50 gigabytes of data.

Each tape cartridge is identified by a colored bar code label that shows the media number (Figure 4). Similarly, each optical media cartridge has bar code labels, one for each side, as shown in Figure 4. The D-3 tapes also use bar code labels, as shown in Figure 5. An archive catalog or database tracks the location of each cartridge within the library, based on information provided by the laser bar code reader.
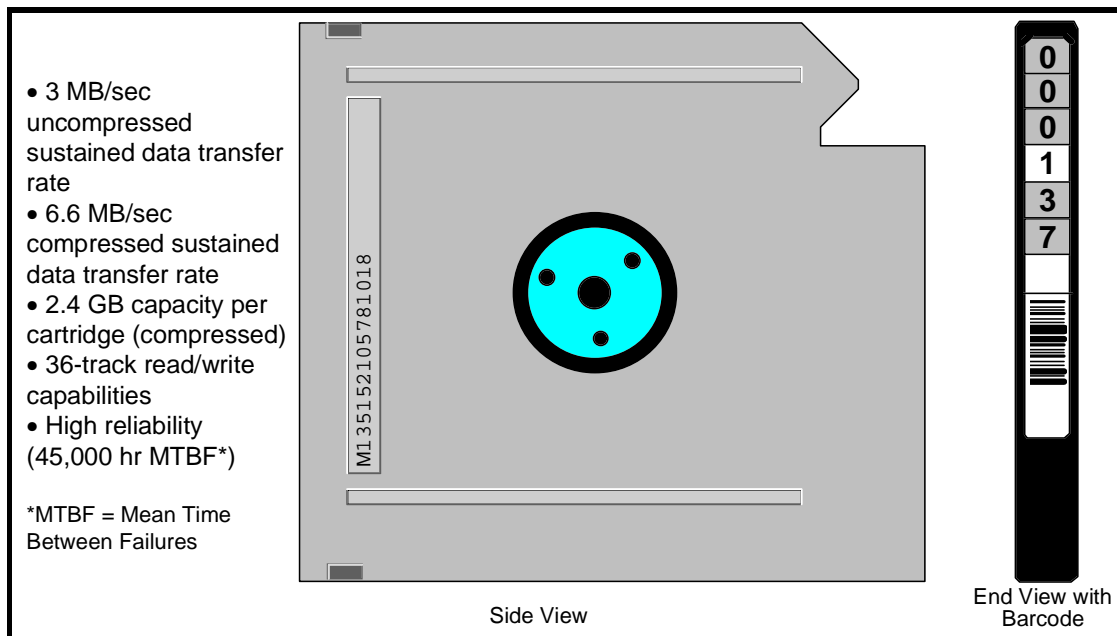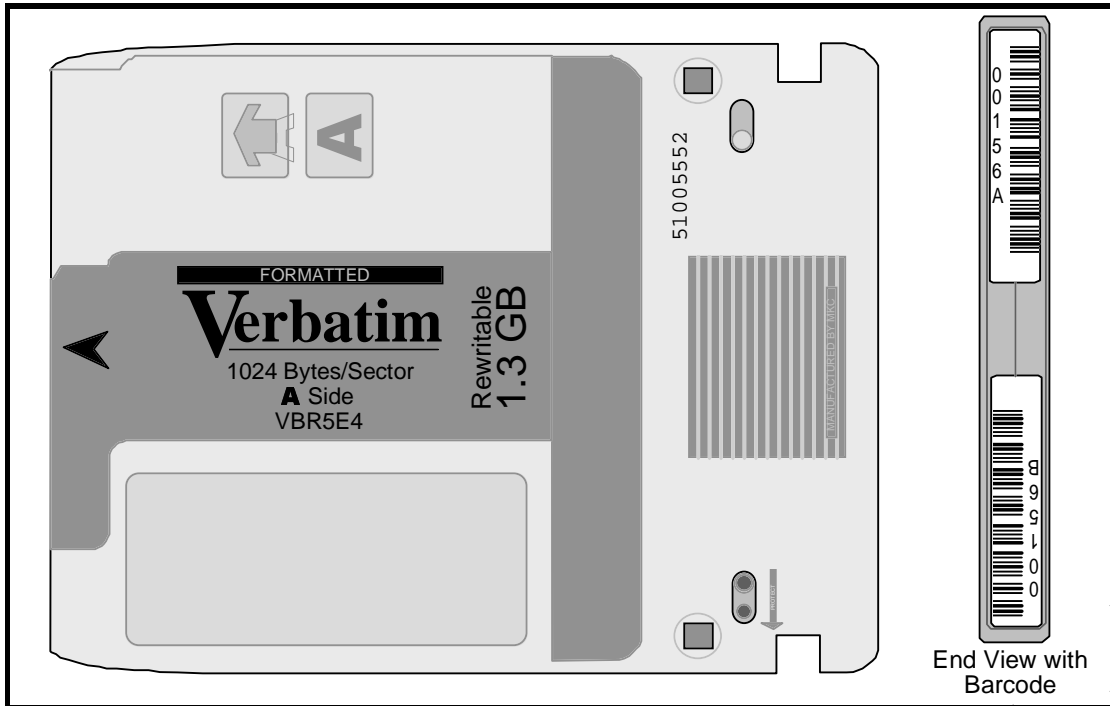

Figure 4. EMASS Tape Cartridge.
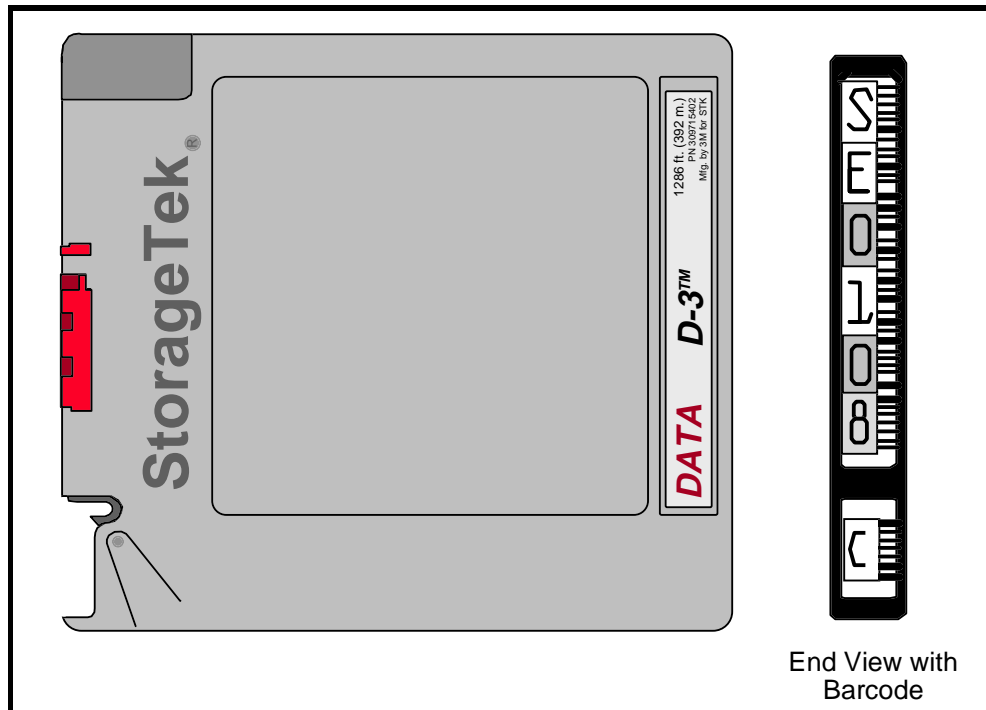
Figure 5. EMASS Archive Optical Cartridge

Figure 6. StorageTek (STK) D-3 Tape Cartridge

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Software

Archive operations rely on both custom and commercial off the shelf (COTS) software for complete mass storage archive management, providing the capability to accept Graphical User Interface (GUI) and command line interface inputs, and to interpret them to the appropriate level needed to control and monitor archive operations. The File Storage Management Service (FSMS) software is the Archival Management and Storage System (AMASS), a product of EMASS, Inc. The purpose of AMASS in the ECS is to provide an easy-to-use interface to a large tape archive. AMASS is a UNIX file system that manages files, volumes (media), drives and jukeboxes. It allows UNIX File System (UFS) access methods to be employed (e.g., ftp, rcp, uucp, nfs, RPC, native) while removing some of the limitations of the UFS. Primary among these is reliance on UNIX Index Node (inode) structures. AMASS maintains all inode information in database files rather than in associated disk structures. This minimizes or eliminates many of the file search problems inherent in searching large numbers of files in multiple directories. In addition, AMASS organizes files as groups of blocks which can be individually retrieved. This differs from UFS resident systems which require staging the entire file.

AMASS is installed on an SGI XL computer. Control information is communicated from the SGI to the AMU using TCP/IP protocols via the FDDI network. Figure 7 shows the basic route taken by control information in the process of sending a file to AMASS.
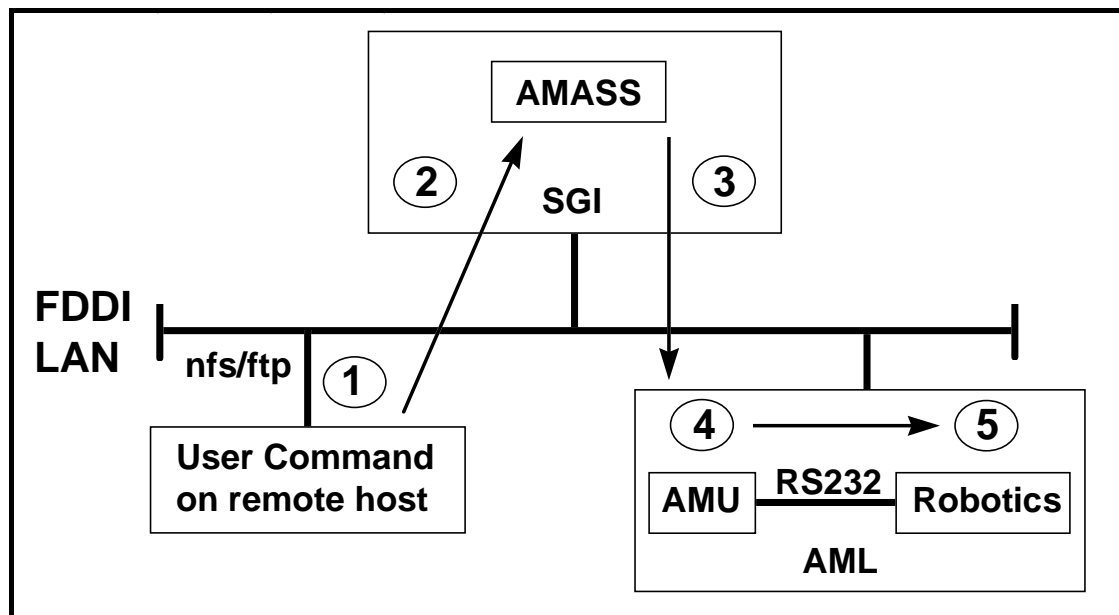

Figure 7. AMASS Control Path

As the figure suggests, there are five elements in the path:

1. The user or application initiates transfer of the file to AMASS.

2. AMASS receives the file over the network via nfs, ftp, dd, or cp, or locally via dd or cp to its cache.

3. AMASS sends information to the AMU to specify the tape to load.

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4. The AMU rotates the tower to the correct position and sends the robot to retrieve the tape.

5. The robot grips the tape, retrieves it, and inserts it into the tape drive to complete the mount.

Data Sources and Uses

Data that are inserted into the archive are managed by the Data Server Subsystem (DSS) and can be received from such sources as the ingest subsystem, processing subsystem, other DAACs, and authorized users (Figure 8). Uses of data from these sources include:

- from ingest – any ECS function that uses data (e.g., production).

- from processing – various ECS functions (e.g., further processing, distribution to users).

- from other DAACs – various ECS functions (e.g., may be needed as inputs for production of other products).

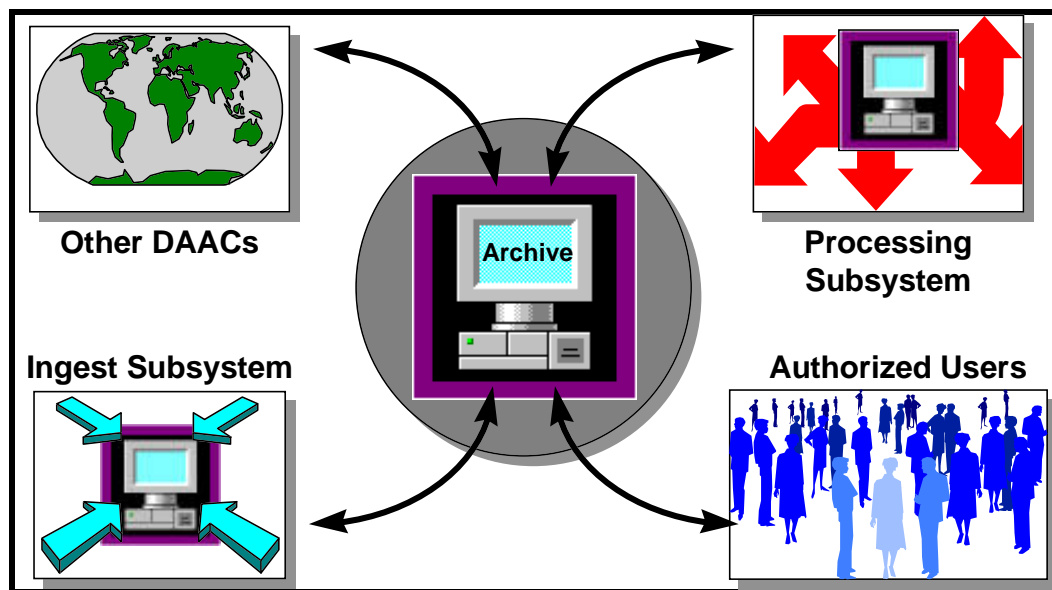- from authorized users (via ingest) – typically for distribution or processing.

Figure 8. Sources and Uses of Archive Data.

Starting and Shutting Down AMASS

The AMASS Tape Archive System can be started and shutdown with little or no impact on the rest of the ECS.

Starting the AMASS Tape Archive System

Starting the AMASS FSMS requires actions at the AMU control panel, illustrated in Figure 9, as well as at the SGI FSMS host. If your DAAC is also using the STK storage system, it will also be necessary to ensure that it is powered up before starting the FSMS. Powering up the STK will require actions at its control panels, including the Library Management Unit (LMU), Library Control Unit (LCU), Controller Transport Rack, and Library Storage Module (LSM). Some of these are illustrated in Figure 10.
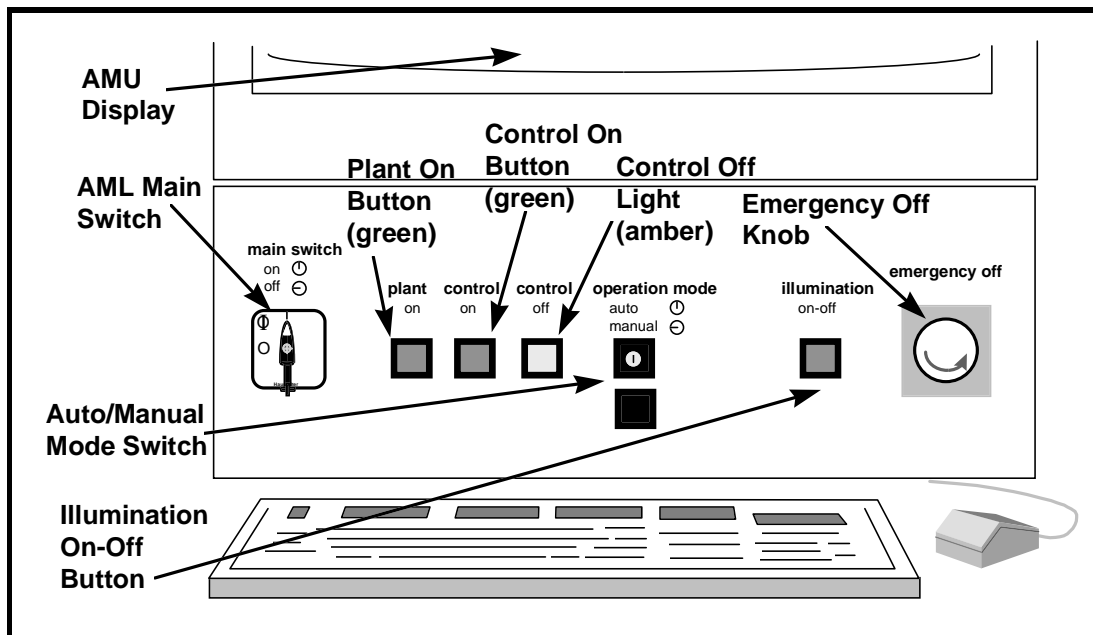

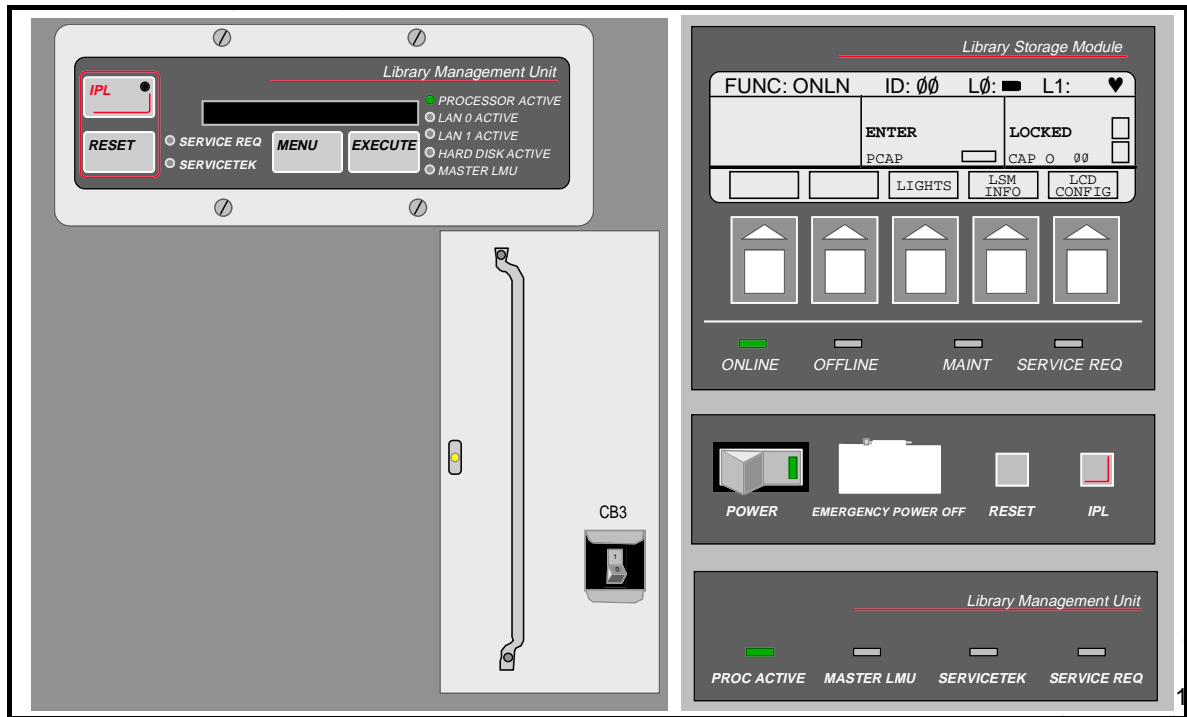**Figure 9. EMASS AML Control Panel**

Figure 10. Control Panels for the STK Library Management Unit (Left) and Library Storage Module (Right)

Use the following procedure to start the AMASS software.

Starting the AMASS Application[1]

Note: Preconditions include that 1) the FDDI network is up and running and 2) power to all units is functional and available..

1   Turn on the **AML main switch**, located above the AMU keyboard shelf, by rotating it to the vertical position.

2   To power up the AMU, open the door beneath the AMU keyboard shelf and press the **power switch** on the left inward.

- The **AMU display** almost immediately shows a blinking cursor in the upper left corner of the display.

3   Press the **Plant On** button.

- The **Plant On** button turns green.

_____

[1] This procedure was taken from a non-technical document entitled *Basic AMASS Procedures, Version 0.7*, dated December 10, 1997.

4   A few seconds later, press the **Control On** button.

- The **Control On** button turns green.

- By this time, OS/2 should have booted; it will automatically start the correct applications.

5   To display the **Log Control Center - Online** display, follow menu path **View→Log**.

- The **Log Control Center - Online** window is displayed on the monitor screen.

- Having been started first, the AML is ready for action, with the SCSI channels for the tape drives set up correctly and the archive prepared for communicating with the host.

6   If the system at your site uses the STK storage equipment, make sure power switches for the STK LMU, LCU, Controller Transport Rack, and LSM are **ON**.

- *NOTE*: The LSM should be the last unit powered up, but otherwise there are no dependencies within the group.

7   If it is not already running, boot the FSMS SGI host normally.

- There are no dependencies on other hosts, COTS or custom software.

- AMASS normally starts automatically on bootup. If it does not, or if you are restarting AMASS after a shutdown, go to **Step 8**.

8   At the FSMS SGI host (workstation *x*0drg##, **xacg##**, or *x*wkg##), as a system administrator (logged in as **root**), type **/usr/amass/tools/amass_start** and then press the **Enter** key.

- NOTE: The *x* in the workstation name will be a letter designating your site: **g** = GSFC, **m** = SMC, **l** = LaRC, **e** = EDC, **n** = NSIDC, **o** = ORNL, **a** = ASF, **j** = JPL; the **##** will be an identifying two-digit number (e.g., **g0drg02** indicates an FSMS SGI server at GSFC).

- The AMASS application starts.

9   To verify that AMASS has started correctly, type **/usr/amass/bin/amassstat -c** and then press the **Enter** key.

- The message **FILESYSTEM IS ACTIVE** is displayed.

Shutting Down AMASS Tape Archive System

If it is necessary to shut down AMASS, use the following procedure.

Shut Down the AMASS Application

1   Log in as **root** (system administrator) at the FSMS SGI host (workstation *x*0drg##,
     *x*acg##, or *x*wkg##).

     - NOTE: The *x* in the workstation name will be a letter designating your site:
       g = GSFC, **m** = SMC, **l** = LaRC, **e** = EDC, **n** = NSIDC, **o** = ORNL, **a** = ASF,
       j = JPL; the ## will be an identifying two-digit number (e.g., **G0drg02** indicates
       an FSMS SGI server at GSFC).

2   Type **/usr/amass/tools/killdaemons**.

     - A message is displayed indicating that all daemons have been terminated.

3   At the AMU, follow menu path **File→Shutdown→Complete**.

          *Note: If it is necessary to perform a full shutdown of
          the EMASS AML, which should be a very rare
          occurrence, perform the following steps.*

4   In the AMU window, follow menu path **File→Quit→AMU Shutdown Only**.

     - The program exits.

5   Click the **Right Mouse Button**.

     - A pop-up menu is displayed.

6   Drag the cursor to select **Shutdown**.

     - A confirmation dialog is displayed.

7   Press the **Enter** key.

8   Turn the **main switch** to **OFF** (horizontal position).

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Entering the AML After AMASS is Started

If it is necessary to enter the AML after AMASS is started, the following procedure is applicable.

Using Manual Mode to Enter the AML

> **Warning**

> If it is necessary to enter the AML after AMASS is started, the following step (Step 1) must be performed first to avoid hazard and ensure safety of personnel and equipment.

1   Turn the **Operation Mode switch**, located above the AMU keyboard shelf, to **manual** by rotating it to the horizontal position.

- The **Control Off** amber light comes on.

- The **Control On** green light goes off.

- All power to the robot and tower is then turned off and it is safe to enter the enclosed area.

2   *Optional*: Press the **Illumination On** button.

- The overhead light in the AML comes on.

3   Turn the key to the access door two full turns counterclockwise to open the door.

Caution

> The following step (Step 4) must be performed before leaving the enclosed area to ensure proper functioning of the AML robot.

4   Before leaving the enclosed area, straighten the robot arm so that it is parallel to the main hallway and pointing to the front of the AML.

> **Warning**

> To avoid hazard and ensure safety of personnel and equipment, the following step (Step 5) must be performed before Step 6.

5   On leaving the area, lock the door by turning the key two full turns clockwise.

6   Turn the **Operation Mode switch**, located above the AMU keyboard shelf, to **automatic** by rotating it to the vertical position.

- The **Control Off** amber light goes off.

- The **Control On** green light comes on.

Insert Data Into the Archive

Storing new data in the archive repository is largely an automated process that does not normally require operator interaction and occurs as a result of operations such as ingest and data production. Any operations involvement would be to support archive administration operations, resolve problems, periodically monitor working storage and archival operations, and coordinate with the appropriate external/internal sources to resolve schedule conflicts.

Because of the automated nature of this process, step-by-step procedures are not required.

Archive Insert Scenario

> **NOTE: The scenario that follows describes the insertion of data into the Data Server at an ECS DAAC and is derived from document 605-CD-002-001, *Release B SDPS/CSMS Operations Scenarios for the ECS Project (March 1996).***

As we have seen, data and associated metadata can be received from numerous sources. This scenario focuses on a routine data insert from the processing subsystem. It assumes that all components are active and not in any degraded modes of operation, that ESDT data collection types have been established, and that the data server's nominal activity rate is 50% of capacity.

Insert Data into the Archive Scenario

1   Initiate the session between the Processing Subsystem and the Data Server.

- The Processing Subsystem sends a Data Insert Request to the Science Data Server.

- Receipt of the request is logged (via MSS Logging Services) and a request identifier is associated with the Data Insert Request.

- The content of the request is validated; if successful, it is queued for later processing. If unsuccessful, a rejection message is issued.

- *The operator may examine the progress of a request by following menu path Other Screens→Logs & Reports (MSS) in the Data Server Subsystem Open Storage Manager (DSS-OSM) to browse the log files provided by the Management Services Subsystem (MSS); see next section for details.*

2   Transfer data from Processing Subsystem to Data Server.

- The queued Data Insert Request is reached and processing begins.

- Associated data granules and metadata are transferred from the Processing Subsystem to the Data Server working storage.

- Data transfer status, including recoverable errors, are indicated in the event log via MSS Logging Services.

- *The operator may check request status at any time using the DSS-OSM **Request Screen**.*

3   Validate metadata received from the Processing Subsystem.

- The metadata update file(s) produced by the associated product PGEs are validated for completeness and correctness.

- Validation success or failure is logged via MSS Logging Services with the associated Data Insert Request Identifier and the appropriate status message is returned to the Processing Subsystem.

4   Store data granules in the permanent archive.

- Upon successful validation of the metadata update file, Science Data Server sends a Data Storage Request to Storage Management.

- The data granules in working storage associated with the Data Storage Request are stored.

- The Archive Activity Log (via MSS Logging Services) records each data product being stored and storage status of each storage operation.

- A checksum value is calculated for each data object associated with each granule.

- The checksum value, storage status, and other selected metadata are forwarded to the Science Data Server in a status message upon completion of the Data Storage Request.

5   Store metadata.

- Science Data Server receives and logs the Data Storage Request status message from Storage Management.

- The additional metadata items are validated.

- The PGE produced metadata update file and the storage management provided metadata are loaded into the metadata database.

- The status of the metadata load is entered in the event log.

- *The operator may examine the progress of the insert by following menu path **Other Screens→Logs & Reports (MSS)** in the DSS-OSM to browse the log files provided by the MSS.*

6   Report Data Insert Request status.

- The Science Data Server logs completion of the Data Insert Request in the event log and reports completion of the Data Insert Request to the Data Archive Manager, the operator console and to the insert Requester (the Processing Subsystem in this scenario).

- Each of the above entities would also be notified if the request failed and reason(s) for failure identified.

7   Process subscriptions based on newly inserted data.

- The Science Data Server will then examine the event list for all subscriptions for that event.

- Subscription notifications are sent to the appropriate entities as appropriate and distribution processing is initiated.

- The Science Data Server sends an Advertisement Update Message to the Advertising Server to advertise the new data.

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Monitor Archive Requests

As previously noted, data that are inserted into the archive can be received from a number of sources including the Ingest Subsystem, Processing Subsystem, other DAACs, and Authorized Users. The Data Ingest Technician (DIT) or other operator can monitor the insertion of data into the archive using the Data Server Subsystem (DSS) GUIs.

Launching DSS GUIs

The following software applications are associated with DSS:

- Science Data Server (SDSRV).
- Storage Management (STMGT) Server.
- Staging Disk Server.
- Staging Monitor Server.
- Archive Server.
- Ingest FTP Server.
- Distribution FTP Server.
- D3 Tape Server.
- 8mm Tape Stacker Server.
- Data Distribution (DDIST) Server.
- DDIST Graphical User Interface (GUI).
- STMGT GUIs (available only after software Drop 4)

It is expected that eventually the ECS DAAC desktop will be configured to allow access to the DDIST and other GUIs using icons. In the interim, access to the DDIST GUI must be gained through the use of UNIX commands.

In any case, launching the DDIST GUI starts with the assumption that the applicable servers are running and the operator (Archive Manager or System Administrator) has logged in.

Launching DSS GUIs Using UNIX Commands

1   Access the command shell.

- The command shell prompt is displayed.

    NOTE: Commands in Steps 2 through 12 are typed at a UNIX system prompt.

2   Type **xhost** + and then press the **Enter** key.

3   Open another UNIX window.

4   Start the log-in to the DDIST client server by typing either **telnet** *hostname* (e.g., **g0dps01**), **rlogin** *hostname*, or **rsh** *hostname* in the second window and then press the **Enter** key.

- If you use the **telnet** command, a **Login:** prompt appears; continue with Step 5.

- If you use either the **rlogin** or **rsh** command, the system uses the User ID currently in use; go to Step 6.

5   If a **Login:** prompt appears, log in as yourself by typing your *UserID* and then pressing the **Enter** key.

6   At the **Password:** prompt type your *Password* and then press the **Enter** key.

7   Type **setenv DISPLAY** *clientname***:0.0** and then press the **Enter** key.

- Use either the terminal/workstation IP address or the machine-name for the *clientname*.

8   Type **cd /***path* and then press the **Enter** key.

- Change directory to the directory (e.g., /usr/ecs/*mode*/CUSTOM/bin/DSS) containing the DSS command files (e.g., EcDsDdistGui).

- The *mode* will most likely be one of the following operating modes:

     — OPS (for normal operation).

     — TS1 (for testing).

     — SHARED (for other uses).

- Note that the separate subdirectories under /usr/ecs apply to different operating modes.

9   To launch the Data Distribution Requests GUI, type the following command: **EcDsDdistGui ConfigFile ../../cfg/EcDsDdistGui.CFG ecs_mode** *mode* and then press the **Enter** key.

- The Data Distribution GUI is displayed.

10   When the Storage Management Control GUI becomes available (software Drop 4), the likely procedure to launch it will be to type the following command: **EcDsStmgtGui ConfigFile [filename] ecs_mode** *mode* and then press the **Enter** key.

- The Storage Management Control GUI is displayed.

The only GUI tool currently available for primary monitoring of archive processing, is the **System Requests** GUI, accessible from the **Data Distribution Requests**.

System Requests Window

The **System Requests** window (Figure 11) displays the following information:

- **Request ID** is a unique identifier for the request.

- **Requester** is the login name of the individual requesting the job or the name of the application running the request.

- **Component** identifies the data server component initiating the request, i.e., Science Server, Document Server, Distribution, and Storage Management.

- **Service request** may be **insert, acquire, store, retrieve**, or **ship**.

- **Status** of a request can be one of the following: **queued, active**, or **completed**.

- **Priority** is either **high, normal**, or **low**, based on the type of request submitted, which can be changed by the operator by using the **Priority Option** button at the bottom of the screen, then clicking on the **Apply** push button.

- The operator can reduce the display list by clicking on the **Filter** push button which opens the **System Management Filter Requests** window
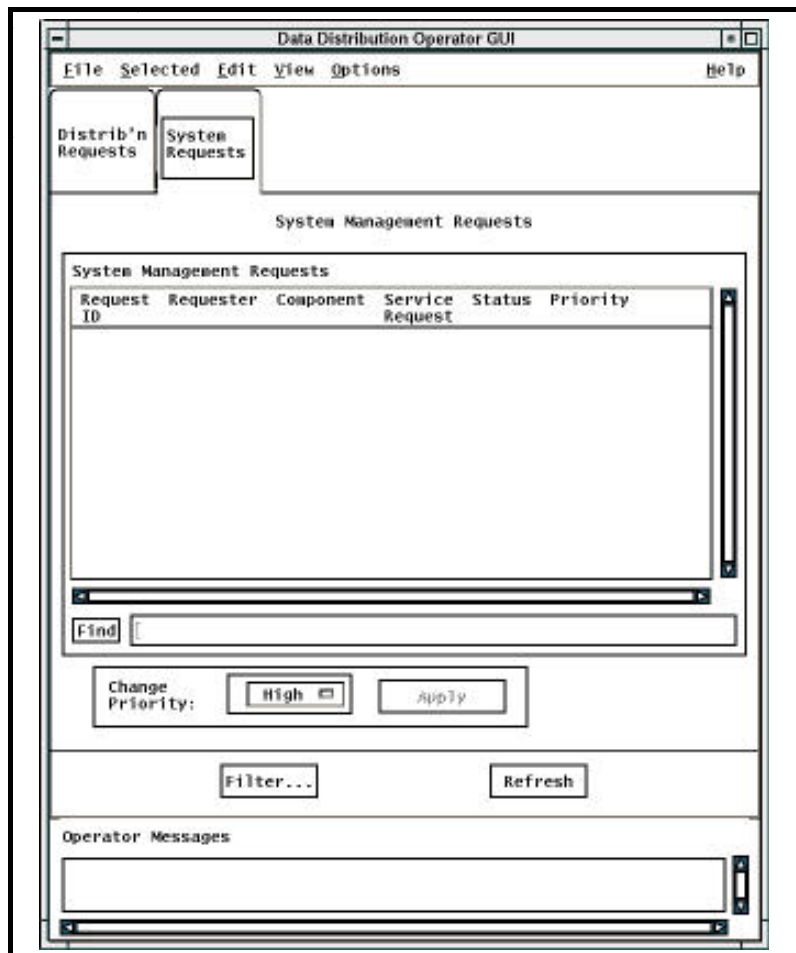

Figure 11. System Management Requests Window

System Management Filter Requests Window

The System Management Filter Requests Window (Figure 12) allows you to limit the scope of the System Management Requests listing by selecting various delimiters such as request IDs, requester names, status, priority, and components.

The operator may implement all the filter changes while keeping the window open by using the **Apply** push button, or implement all the filters and close the filter window by using the **OK** push button.

Figure 12. System Management Filter Requests Window

Distrib'n Requests Window

The Distrib'n Requests window, illustrated in Figure 13, displays detailed information on individual data distribution requests and provides the capability to filter requests, change priority of requests, and designate shipping status. The window contains a list of data distribution requests which can be sorted by column. Priority of a selected request can be changed by selecting the desired priority and clicking on the **Apply** button in the **Change Priority** area. A selected request can be marked to indicate that it has been shipped. An **Abort** button is used to cancel a selected request. Distribution request can also be filtered by attributes, using the **Distribution Filter Requests** window shown in Figure 14.
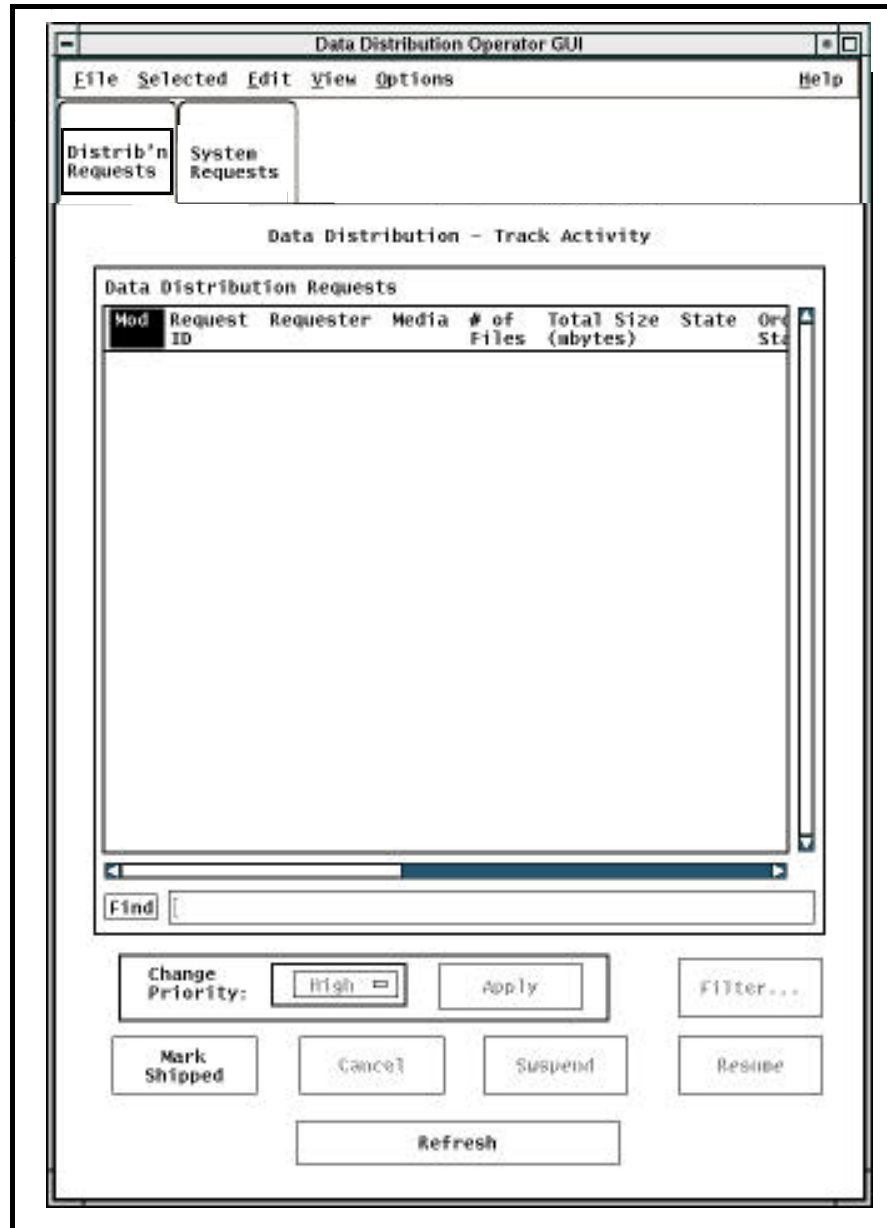

Figure 13. DDIST Distrib'n Requests Window

Figure 14. Distribution Requests Filter Window

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The following procedure illustrates how to monitor requests using the **System Requests** tool and the associated **Filters**.

Monitor Archive Requests Procedure

1   Launch the **DDIST GUI** by using the command line procedure or, if the DDIST icon is available on the DAAC Desktop available, by clicking on that icon.

- The Data Server tool is displayed.

2   **Click** on the **System Requests** tab.

- The System Management Requests window is opened.
- A list of requests is displayed.

3   **Click** the **Filter** push button.

- The **System Management Filter Requests** window is displayed.

4   **Click** on the **Requester** button located in the radio box.

- The cursor moves to the **Requester** field to the right of the radio box.
- The other two selections in the radio box are **Request ID** and **All**.

5   Enter the Requester, then press the **Enter** key.

6   Click on the **All** push button located in the State radio box.

- The remaining choices in the **State** radio box are **Queued, Active, Complete** and **None**.

7   **Click** on the **All** push button, located in the **Priority** radio box.

- The remaining choices in the **Priority** radio box are **High, Medium, Low** and **None**.

8   **Click** on the **All** push button located in the **Components** radio box.

- The remaining selections in the Components radio box are **Science Server**, **Document Server**, **Storage Management**, **Distribution**, and **None**.

9   **Click** on the **OK** push button, located at the bottom of the window.

- The other push buttons located at the bottom of the window are **Apply**, **Cancel**, and **Help**.
- The **System Management Filter Requests** window is closed.
- Because the **All** filter was used for **State**, **Priority**, and **Components**, in the **System Requests** window every request for the specific Provider indicated is displayed.

10   **Click** on a **request** that requires a priority change.

- The request is highlighted.

11   **Click** on the **Priority** Option menu button, until the priority of choice is displayed.

- Choices are **High**, **Medium**, and **Low**.

12   **Click** on the **Apply** push button.

- The priority on the highlighted request is changed.

13   To exit, follow menu path **File**→**Exit**.

Retrieve Data From the Archive

Retrieval of data from the archive is a largely automated process that occurs in response to Data Distribution requests. There are a number of possible sources for Data Distribution requests:

- data orders from scientists or other ECS end users.
    - one-time orders.
    - standing orders placed as subscriptions for acquiring data.
- data requests from other ECS sites.
    - cross-DAAC orders for end users.
    - data needed as input for processing at other sites (subscriptions placed for ingest by those sites).
- internal requests for data needed for processing.

Monitoring Distribution Requests

Placing orders and subscriptions on behalf of scientists or other ECS end users is typically done by User Services representatives. Procedures for these activities are addressed in the training materials for User Services. As ECS responds to these requests, and to requests from other ECS sites or internal processes, the Archive Manager or other operators can monitor the progress of the distribution requests. Suppose that a User Services representative at your DAAC asks you to check on the status of a data distribution request from a user named Ivan Ohrdurr. The following procedure is applicable.

Monitor Distribution Requests

1   Launch the **DDIST GUI** by using the command line procedure or, if the DDIST icon is available on the DAAC Desktop available, by clicking on that icon.

- The Data Server tool is displayed.

2   **Click** on the **Distrib'n Requests** tab.

- The Distribution Requests window is opened.
- A list of requests is displayed.

3   **Click** on the **Filter** push button.

- The **Distribution Filter Requests** window opens.
- Three filter types are displayed: **Request ID**, **Requester**, and **All**.

4   **Click** on the **Requester** button, in the radio box.

- The cursor moves to the selection field to the right of the **Requester**.

5   Enter the requester's name (in this case, **Ohrdurr**) in the text entry field opposite the **Requester** button and label.

6   Click on the **All** button in the **Media Type:** area.

- All of the Media Type toggle buttons show as selected (depressed).

- If you are seeking only requests for a particular set of media, you can select just the button(s) for that set instead of clicking on the **All** button.

7   Click on the **All** button in the **State:** area.

- All of the State toggle buttons show as selected (depressed).

- If you are seeking only requests in a particular state or states, you can select just the button(s) for the desired state(s) instead of clicking on the **All** button.

8   **Click** on the **OK** push button, located at the bottom of the window.

- The other push buttons located at the bottom of the window are **Apply**, **Cancel**, and **Help**.

- The **Filter Requests** window is closed.

- The Distribution Requests screen shows any requests that meet the filter criteria in the **Data Distribution Requests** field.

9   If necessary, use the scroll bar at the bottom of the **Data Distribution Requests** field to scroll horizontally to view the state of the Ohrdurr request(s).

Loading Archive Media

Automatically Loading Archive Media

Media are inserted into and ejected from the EMASS archive system through the Entry Interface Facility (EIF). Cartridges are loaded by hand into hand-carry racks, each with a capacity of 30 half-inch tape cartridges or 22 optical cartridges. The robot system physically moves each cartridge from the EIF to the AML. EMASS recommends that you turn ON the Auto Import option for each library. With this option on, you only need to place media into the EIF and close it.

For the STK storage facility, each Powderhorn is equipped with a 21-tape Cartridge Access Port (CAP). In automatic mode, tapes may be placed in the CAP for automatic loading. Tapes are also ejected through the CAP when identified for ejection using a command at the host for the STK Automated Cartridge System Library Software (ACSLS).

The following procedures address media loading.

Automatically Loading EMASS Archive Media Procedure

1   To log in, type **amass** or **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3   Press the **EI On** button on the EIF (to the left of the glass door).

- After a few seconds, the green light comes on (wait for it).

4   Remove the left box to insert or remove tape media, and/or remove the right box to insert or remove optical media.

5   Write down or note the bar code numbers on the labels of the cartridges, insert the cartridges in the removed box(es), reinsert the box(es) in the EIF, and close the door.

- The robot scans all the volumes.

6   At the AMASS host, type **/usr/amass/bin/bulkinlet SP** and then press the **Enter** key.

- Data for the newly inserted media are displayed, including bar codes, associated volume numbers, and, in the **flag** column, the letters **IUO**, indicating that the volumes are inactive (**I**), unformatted (**U**), and offline (**O**).

7   For any newly inserted media, it is necessary to issue a formatting command. For tapes, type **volformat ###**, where **###** is the volume number. For optical cartridges, type **volformat -p ###**, where **### &** is the volume number. You can enter more than one, separating each number from the preceding one with a space.

- *Note*: You may wish to use the **&** (to run the process in the background) for formatting tapes as well as for optical cartridges. It is highly recommended for formatting optical cartridges, because of the length of time required.

- A message requests confirmation that you wish to continue.

8   Type **y** and then press the **Enter** key.

- A message is displayed requesting further confirmation, stating that **The following volumes will be formatted:** and listing volume numbers, followed by **(Y-N)**.

9   Type **y** and then press the **Enter** key.

- After a few minutes (or, for optical cartridges, about an hour for each), a message **Completed formatting all volumes** is displayed.

10   To verify that the volume(s) are inserted, type **/usr/amass/bin/vollist** and then press the **Enter** key.

- Data for the media are displayed; the **flag** column shows that the newly formatted volumes are inactive (**I**).

11   To activate the media for use, type **volstat**.

- Data for the media are displayed; the **flag** column shows that the volumes are now active (**A**).

Automatically Loading STK Archive Media Procedure

1   To log in, type **amass** or **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3   Write down or note the bar code number(s) on the label(s) of the cartridge(s), open the recessed latch on the Cartridge Access Port (CAP) door and insert the tape(s), solid black side up, with the bar code label facing you, and close the door.

- The robot scans all the volumes.

4 At the AMASS host, type **/usr/amass/bin/bulkinlet SP** and then press the **Enter** key.

- Data for the newly inserted media are displayed, including bar codes, associated volume numbers, and, in the **flag** column, the letters **IUO**, indicating that the volumes are inactive (**I**), unformatted (**U**), and offline (**O**).

5 For each volume, type **tapelength ### 2**, where **###** is the volume number.

- A message is displayed indicating the tape length variable has been changed to **2**. (STK may use any of three tape lengths; the **tapelength** command specifies the 50-gigabyte D-3 tapes used in ECS.)

6 For any newly inserted media, it is necessary to issue a formatting command. For the new D-3 tapes, type **volformat -b 256k ###**, where **###** is the volume number. You can enter more than one, separating each number from the preceding one with a space.

- A message requests confirmation that you wish to continue.

7 Type **y** and then press the **Enter** key.

- A message is displayed requesting further confirmation, stating that **The following volumes will be formatted:** and listing volume numbers, followed by **(Y-N)**.

8 Type **y** and then press the **Enter** key.

- After a few minutes, a message **Completed formatting all volumes** is displayed.

9 To verify that the volume(s) are inserted, type **/usr/amass/bin/vollist** and then press the **Enter** key.

- Data for the media are displayed; the **flag** column shows that the newly formatted volumes are inactive (**I**).

10 To activate the media for use, type **volstat**.

- Data for the media are displayed; the **flag** column shows that the volumes are now active (**A**).

Manually Loading Archive Media

With the **bulkload** command, you bypass the EIF and manually load media directly into the library bins. Typically, this will only be done at the initial load of the system with large numbers of media volumes. The **bulkload** command enables AMASS to determine what type of media have been placed in the library and to convey this information to the AMASS database. The following procedures are applicable.

<div style="text-align:center;border:1px solid;">

Warning

</div>

If it is necessary to enter the AML after AMASS is
started, the following step (Step 1) must be performed
first to avoid hazard and ensure safety of personnel and
equipment.

1   Turn the **Operation Mode switch**, located above the AMU keyboard shelf, to
manual by rotating it to the horizontal position.

- The **Control Off** amber light comes on.

- The **Control On** green light goes off.

- All power to the robot and tower is then turned off and it is safe to enter the
enclosed area.

2   Press the **Illumination On** button.

- The overhead light in the AML comes on.

3   Turn the key to the access door two full turns counterclockwise to open the door.

4   Physically enter the library and load the desired media into the bins.

<div style="text-align:center;">

Caution

</div>

The following step (Step 5) must be performed before
leaving the enclosed area to ensure proper functioning
of the AML robot.

5   Before leaving the enclosed area, straighten the robot arm so that it is parallel to the
main hallway and pointing to the front of the AML.

<div style="text-align:center;border:1px solid;">

Warning

</div>

To avoid hazard and ensure safety of personnel and
equipment, the following step (Step 6) must be
performed before Step 7.

6   On leaving the area, lock the door by turning the key two full turns clockwise.

7   Turn the **Operation Mode switch**, located above the AMU keyboard shelf, to **automatic** by rotating it to the vertical position.

- The **Control Off** amber light goes off.

- The **Control On** green light comes on.

8   At the AMASS host, type **bulkload -s SP** and then press the **Enter** key.

- The AMASS database is populated with data for the volumes in the AML.

9   To view a list of media in the AML, type **medialist [-#]** (where **#** is the jukebox identification number), and then press the **Enter** key.

- If you do not specify a jukebox number with the **-#** option, the default is **1**, which specifies the EMASS AML tapes. If you want to specify a different jukebox, specify **-2** to indicate the EMASS AML optical cartridges.

- The utility reads the library element status stored in the library, and information about the library contents, including the status (**FULL** or **EMPTY**) of the elements.

Manually Loading STK Powderhorn Archive Media Procedure

1   To manually insert a tape into the Powderhorn, login to the control software (ACSLS) using the acssa account.

2   Type **enter 0,0,0** and then press the **Enter** key.

- The Cartridge Access Port (CAP) door unlocks.

3   Write down or note the bar code number(s) on the label(s) of the cartridge(s), open the recessed latch on the Cartridge Access Port (CAP) door and insert the tape(s), solid black side up, with the bar code label facing you, and close the door.

- The robot scans all the volumes.

4   At the AMASS host, type **bulkinlet SP** and then press the **Enter** key.

- If you are manually loading a large number of tapes, you can use the command **bulkload -s SP**.

- Data for the newly inserted media are displayed, including bar codes, associated volume numbers, and, in the **flag** column, the letters **IUO**, indicating that the volumes are inactive (**I**), unformatted (**U**), and offline (**O**) (or, if you use the **bulkload -s SP** command, the AMASS database is populated with data for the volumes in the library.

5   To view a list of media in the library, type **medialist -3**, and then press the **Enter** key.

- The **-3** option indicates the STK Powderhorn.

- The utility reads the library element status stored in the library, and information about the library contents, including the status (**FULL** or **EMPTY**) of the elements.

Remove Media

To remove media from the archive, use the following procedures.

Remove Media from EMASS AML or STK Powderhorn

1   Determine which volumes you want to remove by utilizing the volume number. If necessary to review volume numbers and other information, log into the AMASS host, type **/usr/amass/bin/vollist** and then press the **Enter** key.

2   If there are only a few volumes to remove, from AMASS, for each volume to be removed type **/usr/amass/bin/voloutlet ###**, where **###** is the volume number, and then press the **Enter** key.

- AMASS marks the volume off-line and the volume is transferred to the EIF or CAP.

3   For the EMASS AML, press the **EI On** button on the EIF (to the left of the glass door).

- After a few seconds, the green light comes on (wait for it).

4   Remove the left box to insert or remove tape media, and/or remove the right box to insert or remove optical media.

5   For the STK Powderhorn, open the recessed latch on the Cartridge Access Port (CAP) door and remove the tape(s)

Backup Archived Data

The ECS archive design incorporates programmed backups of archived data. System requirements specify that a percentage of archived data be duplicated for local and off-site storage to provide for data safety. However, the large volume of ECS archived data merits finding alternatives to complete backup of all volumes in the libraries. Selection of data for backup is based on assessment of the feasibility of recovery in the event of data loss.

It is imperative to backup data that would be irretrievable if lost. Such data are saved to the archive, saved to local backup, and saved to off-site backup. Many data elements that will be archived, however, could be retrieved in the event of loss. For example, in the event of loss of a higher level product that is an output of processing a lower level product, it would be possible to restore the higher level product by reprocessing the lower level product. As another example, ECS will often archive a lower level product from a data provider, but that product may also be retained in the archives of the data provider. If the product were lost from the ECS archive, it would be possible to ingest it again from the data provider, using appropriate Ingest procedures.

Thus, when data are inserted into the archive (e.g., through Ingest, from Processing), up to three copies of the data may be created, reflecting different types of data use:

- the active archive copy, available for distribution or other use.

- a copy to be retained for local backup.

- a copy to be sent to off-site backup storage.

The GDAAC sends its off-site backup data to the LDAAC. The GDAAC is the off-site storage facility for LDAAC and all other DAACs.

The local backup and off-site backup cartridges are removed from the archive storage facility using procedures already described. For local and/or off-site storage of specific archive data, the DAAC Archive Manager (DAM) generates or directs the generation of a list of selected data. At the time the files are archived, they are written to specific volume groups which correspond to the three data usage types identified in the preceding paragraph. Only files belonging to the data usage type are written to the tapes in a specific volume group. Hence, the DAM can determine the tapes which should be stored for local backup and which for off-site storage. This can be accomplished using the AMASS administration **vollist** command.

vollist - this command lists all volumes and their current status information. It will optionally accept a specific volume number. Information displayed includes: volume number, volume group, jukebox number, slot position, volume label/bar code, current volume status, amount of used space on the volume, amount of available space on volume, percentage of space no longer referenced, and number of read or write errors on volume

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If there are other files designated for local and off-site backup which have not been written to a specific volume group, the DAM can use the appropriate AMASS administration commands, **dirfilelist** and/or **volfilelist**, to locate the appropriate archive volume which contains the designated archived files.

> **dirfilelist:** this command lists the files under a directory. One directory or file is displayed on a line. Information displayed includes: file name, volume number, starting block number, file size, file permissions, number of hard links, numeric user id, numeric group id, last time file was accessed, and last time file was modified.

> **volfilelist:** this command lists all of the files on a volume and accepts as input a volume number. One file is displayed on a line. Information displayed includes: file name, volume number, starting block number, file size, file permissions, number of hard links, numeric user id, numeric group id, last time file was accessed, and last time file was modified.

For more information about these AMASS commands, refer to the *AMASS System Administrator's Guide, Version 4.9.*

Creating a Backup for AMASS

The DAM should periodically create a backup to guard against loss of the AMASS database and functioning. The archive storage format used by AMASS is a proprietary format designed to optimize storage and retrieval speed. The command **vgexport -q** can be used to create a text file, storable on magnetic media, which can be used with the AMASS format archive tapes and the command **vgimport** to recover from the loss. This command exports the AMASS database for a specified volume group to standard out (**stdout**), a file containing the directory structure and media attributes (e.g., media type, ownership, timestamp) for the volume group. The file is located in **/usr/amass/filesysdb** and is exported as standard ASCII text. Use the following procedure.

Create a Backup for AMASS

1   To log in, type **amass** or **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3   Type **vgexport -q**.

- A file named **stdout** is created in **/usr/amass/filesysdb**.

- *Note*: The **stdout** file is useful only with the archive volumes represented in the AMASS database.

Replacing the AMASS Database Backup Volume (Volume 1)

The AMASS database backup is stored in the archive on Volume 1. AMASS issues a warning message when the backup volume is almost full. If a **95% full** warning message is displayed *before* a backup starts, it is necessary to initialize a new backup volume and perform a full backup as described in the following procedure.

Replace a Full Backup Volume (Volume 1)

1   To log in, type **amass** or **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

- You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

3   Type **voloutlet 1** and then press the **Enter** key.

- The AML robot places the Backup Volume in the EIF.

4   Press the **EI On** button on the EIF (to the left of the glass door).

- After a few seconds, the green light comes on (wait for it).

5   Remove the left box, remove the Backup Volume tape, and store it in a safe place.

6   Physically designate the new Backup Volume tape so that it can be easily discriminated from other volumes (e.g., write "Backup Volume" on the tape, color code the tape, or make and display a note of its home storage slot or preprinted barcode.

7   Note the pre-printed number on the volume label (e.g., 112102), insert the new Backup Volume in the removed box, reinsert the box in the EIF, and close the door.

- The robot scans the volume.

8   At the AMASS host, type **/usr/amass/bin/bulkinlet -u** and then press the **Enter** key.

- AMASS assigns the Backup Volume a unique volume number.

- AMASS marks the volume **ONLINE** in the AMASS database.

- AMASS assigns the Backup Volume to the last barcode position in the library.

- AMASS gives the volume a **BACKUP VOLUME** label.

9   Type **vollist**, and then press the **Enter** key.

- AMASS displays the following:

```
VOL   VOL   JUKE   POS   VOL       FLAGS   USED   AVAIL   DEAD   ERRS
NUM   GRP   NUM          LABEL             (MB)   (MB)    (%)
1     0     1           BACKUP-VOLUME  I   0      20000   0      0
```

10   To change the Volume Label field from **BACKUP-VOLUME** to the preprinted media number (e.g., 112102), type **vollabel 1 112102** and then press the **Enter** key.

11   Type **vollist**, and then press the **Enter** key.

- AMASS displays the following:

```
VOL  VOL  JUKE  POS  VOL       FLAGS  USED  AVAIL  DEAD  ERRS
NUM  GRP  NUM        LABEL             (MB)  (MB)   (%)
1    0    1          112102    I      0     20000  0     0
```

12   Type **volformat -u** and then press the **Enter** key.

- A message requests confirmation that you wish to continue.

13   Type **y** and then press the **Enter** key.

- A message is displayed requesting further confirmation, stating that **The following volumes will be formatted: 1 (Y-N)**.

14   Type **y** and then press the **Enter** key.

- After a few minutes, a message **Completed formatting all volumes** is displayed.

15   To verify that the volume is inserted, type **/usr/amass/bin/vollist** and then press the **Enter** key.

- Data for the media are displayed; the **flag** column shows that the newly formatted volume is inactive (**I**).

16   Type **amassbackup -fv** and then press the **Enter** key.

- AMASS performs a full backup with the verbose option of the AMASS database and transaction logs.

Create Replacement Backups Manually from Existing Archives

If loss of data necessitates obtaining and inserting backup data from local or off-site storage, it is necessary to create replacement data to be returned to backup storage. Use the following procedure.

Create Replacement Backups

1   To log in, type **amass** or **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

3   You are authenticated (as **amass** or **root**) and returned to the UNIX prompt.

4   Type **volcopy -cv** *<destination> <source>* (where *<destination>* is the volume number of the destination volume and *<source>* is the volume number of the source volume), and then press the **Enter** key.

- The **-c** option specifies copy of the source to the destination. The **-v** option verifies the copy process.

- A bit for bit copy of the source (the cartridge to be copied) is made at the destination (an available, unused cartridge). Because the copy procedure depends on the amount of data on the source cartridge, the process can take as long as an hour to complete.

- *Note*: After starting a **volcopy** procedure, do not attempt to kill the process with the **kill -9** command.

5   A hardcopy/softcopy list of the files backed up should be created and kept for future file restoration operations.

6   Remove the backup volume(s) and send to local or off-site storage area, as appropriate.

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Restore Archive Data

Use of Backup Data for Recovery

Depending upon the circumstances and nature of the loss, restoration of archive data may take the form of reprocessing, obtaining replacement data from an external data provider, replacing damaged or corrupted volumes with backup volumes, or restoring the AMASS database. In the event of catastrophic loss of the archive and local backup cartridges, it will be necessary to retrieve backups from off-site storage. A different process required to recover from a failed attempt at archive storage is also addressed here.

Reprocessing

If it is possible to produce a lost data product by running a Product Generation Executive (PGE) on other data available in the archive, recovery of the lost product may be achieved by this reprocessing. The reprocessing will be a case of on-demand processing, for which procedures are addressed in a separate lesson on Production Planning and Processing.

Requesting Replacement Data from Provider

Where the archived data that are lost are not available in local or off-site backups, but were originally acquired from an external data provider who retains a copy of the data in the archives of the data provider, recovery may be achieved by re-ingesting the data. The re-ingest will entail ingest procedures that are addressed in a separate lesson on Ingest.

Data Recovery by Inserting Backup Tapes

Where the archived data that are lost are available in local or off-site backups, recovery may be achieved by obtaining the appropriate backup cartridge(s) and performing the procedure for manual loading of the cartridge(s) in the proper location(s) in the archive storage facility. The procedures for loading archive media were addressed under a preceding topic. Once the loading is complete, perform the procedure to create replacement backups as addressed under the previous topic, and send the replacement backup to the appropriate storage.

Recovery from Failure to Store Data

When a storage failure occurs, the request is put on an Operator Intervention List and appropriate operations personnel are notified. Later releases of ECS will provide Storage Management GUIs permitting the operator (e.g., Data Ingest Technician) to review the error messages, as well as AMASS commands and utilities, and to resume the request once the problem is resolved. Without those GUIs, the operator may have to rely primarily on monitoring of system tail logs in UNIX windows in order to track storage activity.

Recovery from Failure to Store Data Procedure

1   Log into the **data server** using your user identifier and password by typing
YourUserID, then press **Return**.

- A password prompt is displayed.

2   Enter *YourPassword*, then press **Return**.

- Remember that *YourPassword* is case sensitive.

- You are authenticated as yourself and your desktop is configured with many icons including the data server icon.

3   Use the **amass_log** script to display AMASS errors, as described in the next section.

4   Each AMASS entry in the system log file has a date and time stamp. Several days' worth of messages may exist in the log. When reviewing the output to determine if any of these messages might indicate the cause of the problem, make sure that the messages being looked at are for the correct date and time.

5   See the "Error Messages" in the appendix of the *AMASS System Administrator's Guide, Version 4.9*, for probable causes and possible solution to the problem.

- After the corrective action has been performed, see if the problem is corrected.

- If the problem persists, contact the appropriate personnel.

Monitor Archive System and Fault Notification

There are several troubleshooting tools provided with AMASS that can assist you in monitoring archive activity and in responding to fault notifications. The AMASS *System Administrator's Guide* includes instructions on using these tools. Two of the most useful ones are addressed here.

AMASS Utilities and Scripts for Monitoring and Fault Response

One of the library utilities included with AMASS is **quedisplay**. This utility permits the operator to see what is in the queue, and to diagnose problems such as the following:

- During an attempt to write to a file, the drive light does not illuminate.

- The system is slowing down.

- An AMASS command does not complete.

Figure 15 shows an example of the form of the output of the **quedisplay** utility. The output shows the queue, which consists of read and write requests, AMASS administration commands, and a list of libraries, drives, and what volumes they manage.
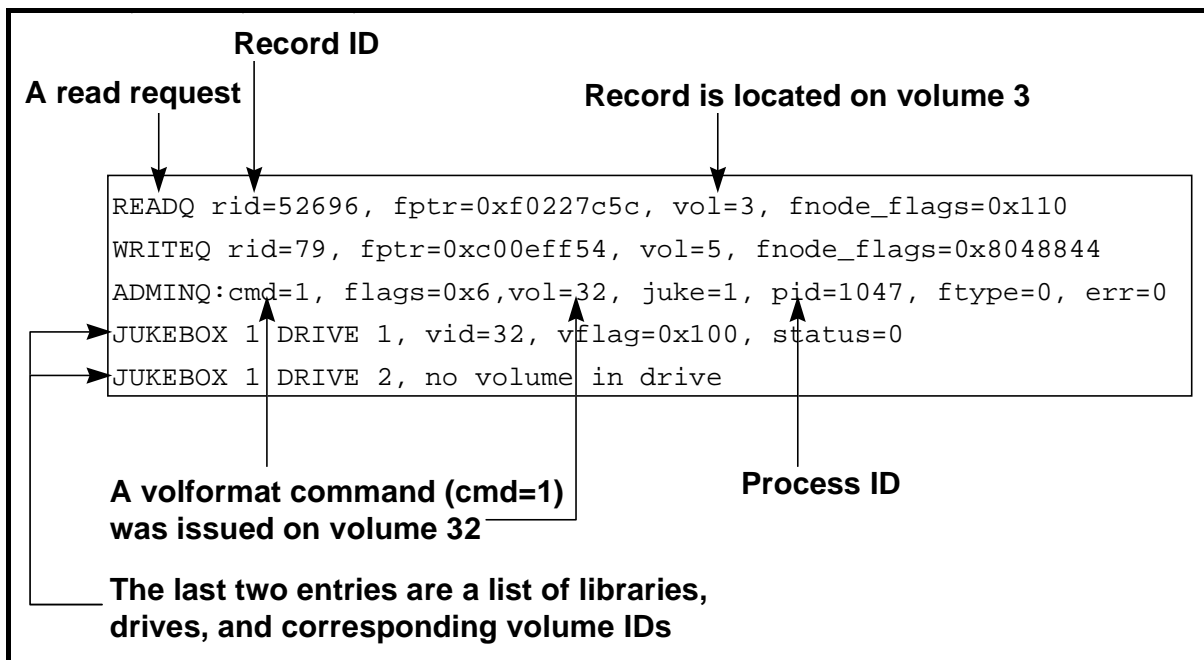

Record ID

A read request

Record is located on volume 3

```
READQ rid=52696, fptr=0xf0227c5c, vol=3, fnode_flags=0x110
WRITEQ rid=79, fptr=0xc00eff54, vol=5, fnode_flags=0x8048844
ADMINQ:cmd=1, flags=0x6,vol=32, juke=1, pid=1047, ftype=0, err=0
JUKEBOX 1 DRIVE 1, vid=32, vflag=0x100, status=0
JUKEBOX 1 DRIVE 2, no volume in drive
```

A volformat command (cmd=1) was issued on volume 32

Process ID

The last two entries are a list of libraries, drives, and corresponding volume IDs

Figure 15. Sample output from AMASS quedisplay *utility*

Use the following procedure to monitor what is in the queue.

Use *quedisplay* to View What is in the AMASS Queue

1   To log in, type **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

3   You are authenticated (as **root**) and returned to the UNIX prompt.

4   To change to the utilities directory, type **cd /usr/amass/utils**, and then press the **Enter** key.

5   Type **quedisplay**, and then press the **Enter** key.

- The AMASS queue is displayed.

Another useful AMASS tool is the **amass_log** script. This script displays AMASS messages from the system log file. This script can provide helpful information under several circumstances, such as when a command gives unexpected results or when AMASS appears not to be functioning properly in other ways. Use the following procedure to run **amass_log**.

Use the *amass_log* script to Display AMASS Errors

1   To log in, type **root** and then press the **Enter** key.

- A password prompt is displayed.

2   Enter the *Password*, then press **Return**.

- Remember that *Password* is case sensitive.

3   You are authenticated (as **root**) and returned to the UNIX prompt.

4   To change to the AMASS tools directory, type **cd /usr/amass/tools**, and then press the **Enter** key.

5   Type **./amass_log** *logfilepath*, where *logfilepath* is the pathname of the system log file to scan for AMASS messages, and then press the **Enter** key.

- On a Sun, the *logfilepath* is likely to be **/var/adm/messages.1**. Any AMASS error messages in the scanned log file are displayed.

6   Perform the action recommended in the log.

- The AMASS *System Administrator's Guide* provides detailed information concerning error messages. An error message informs of critical problems that prevent AMASS from functioning. An error message is usually followed by a

correction message, which provides instructions for correcting the situation. Sometimes, there is a previous warning message that may provide an accompanying correction message. Other messages may be identified by number only; the *System Administrator's Guide* provides a reference list, with accompanying corrective actions.

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Practical Exercises

Introduction

This exercise is designed to practice key elements of the System Troubleshooting procedures. Perform the tasks identified in the exercise.

Equipment and Materials

One ECS workstation, the EMASS Automated Media Library, the STK Powderhorn storage facility, a copy of 609-CD-003-001 *Operations Tools Manual*, and a copy of 611-CD-004-001 *Mission Operations Procedures for the ECS Project*.

Perform Activities Related to Archive Processing

1. Locate the EMASS Automated Management Unit and the AMASS host. Point out the elements and sequence involved in starting AMASS.

2. At the STK Powderhorn, locate the control panels necessary for power up (or down) and identify all Power Switches.

3. Following all safety precautions, place the EMASS AML in manual mode and enter the unit; leave the unit and restore it to automatic mode.

4. Launch the Data Distribution Graphical User Interface (GUI); examine the list of distribution requests. Then filter the list to examine only those requests that are staging.

5. Use automatic loading procedures to load a tape into the EMASS AML. Use automatic loading procedures to load an optical cartridge into the EMASS AML. If your site archive facilities include the STK Powderhorn, use automatic loading procedures to load a D-3 tape into it. Then use automatic unloading procedures to remove the media you just loaded.

6. Experiment with the **vollist**, **dirfilelist**, and **volfilelist** commands for AMASS. Describe for yourself how the commands can be used to help you manage the archive.

7. Use the **vgexport -q** command to create a backup for the AMASS database.

8. Look at the AMASS queue by using the **quedisplay** command.

9. Run the **amass_log** script to display AMASS messages in **/var/adm/messages.1** system log file.
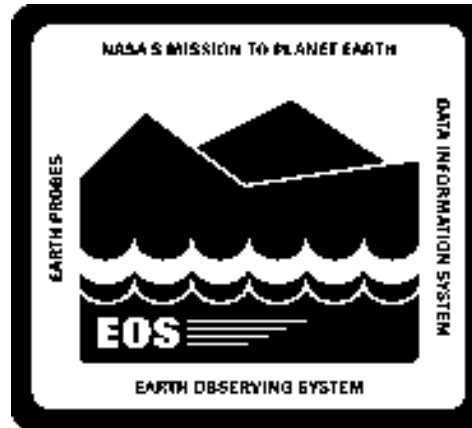
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Slide Presentation

Slide Presentation Description

The following slide presentation represents the slides used by the instructor during the conduct of this lesson.

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ARCHIVE PROCESSING

ECS Version 2.0 Training

Overview of Lesson

- **Introduction**

- **Archive Processing Topics**
  - **Archive Hardware and Software**
  - **Start and Shut Down AMASS**
  - **Insert and Retrieve Data**
  - **Delete Pull Disk Data**
  - **Load Archive Media**
  - **Backup and Restore Archive Data**
  - **Monitor Archive System and Respond to Fault Notification**
  - **Monitor Temporary Data Storage of Intermediate Files**

- **Practical Exercise**
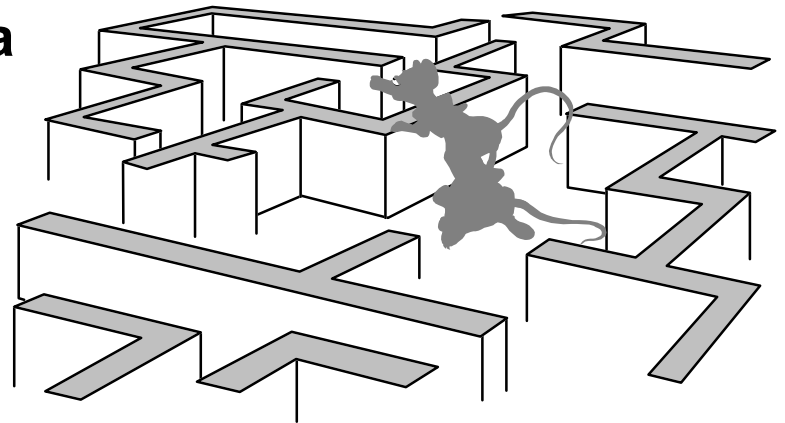
Objectives

- **Overall: Proficiency in Archive Processing**
    - **Insert new data into the archive**
    - **Retrieve data from the archive**
    - **Delete files from the archive**
    - **Delete pull disk data**
    - **Delete staging disk data**
    - **Distribute files from disk to tape**
    - **Ingest files to disk**
    - **Backup archive data**
    - **Restore archive data**
    - **Monitor archive system and perform fault notification**
    - **Monitor Temporary storage of intermediate files**

DAAC Archive Manager Interfaces

**DAAC
Science Data
Specialist**

Ingest and Data Server
configuration notification;
Problems

Input/distribution
network problems,
coordination of resources

**DAAC
Resource Manager**

**DAAC
Archive Manager**

**DAAC
Science
Coordinator**

New/unapproved data archive requests,
Archive QA level reports; Archive
approval, metadata/browse/advertising data

**DAAC
Ingest/Distribution
Technician**

Direction, configuration, Ingest
and Data Server; Status

4

EMASS Archival Management and Storage System

STK Powderhorn
Library Storage Module (LSM)

EMASS Archive Tape Cartridge

- 3 MB/sec uncompressed sustained data transfer rate
- 6.6 MB/sec compressed sustained data transfer rate
- 2.4 GB capacity per cartridge (compressed)
- 36-track read/write capabilities
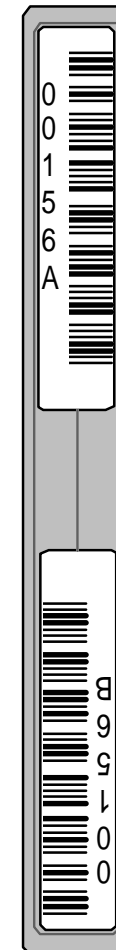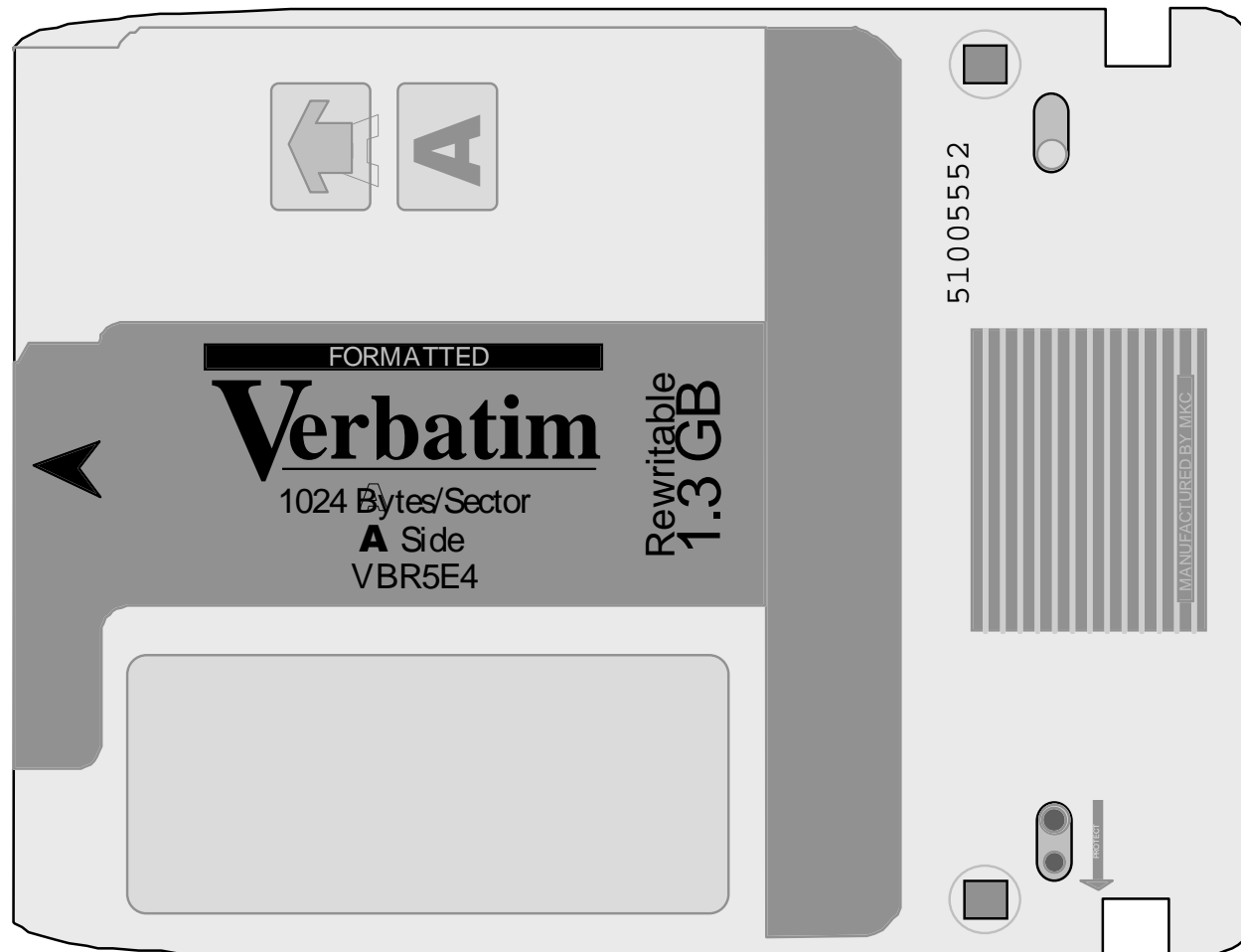- High reliability (45,000 hr MTBF*)

*MTBF = Mean Time Between Failures

M135152105781018
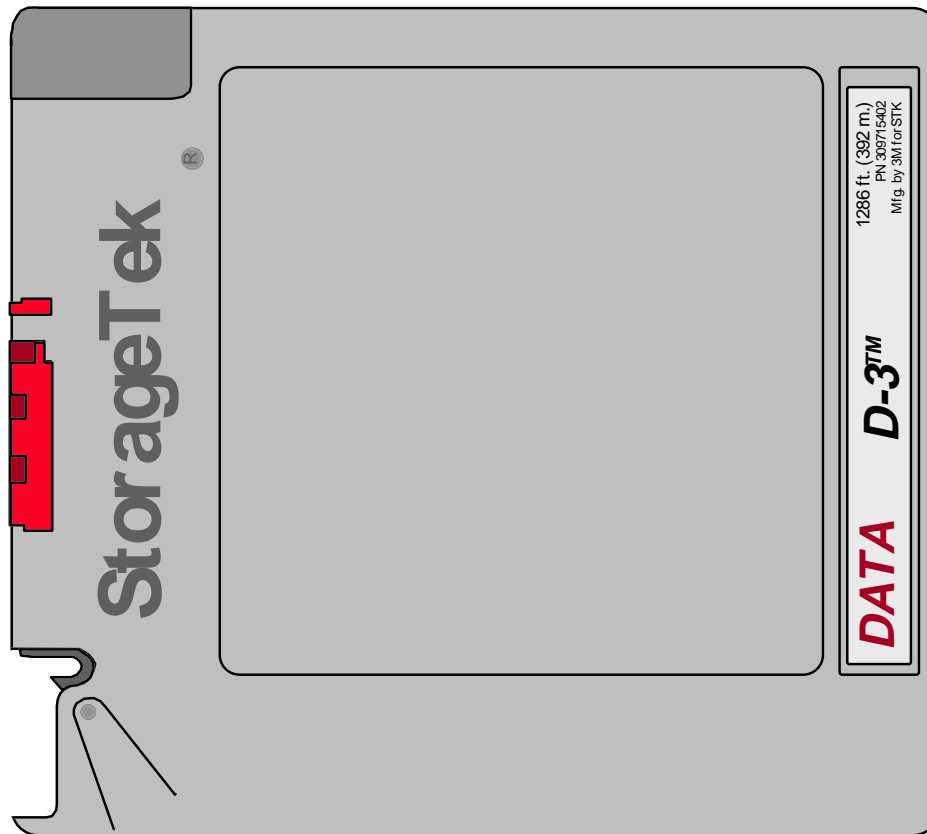
Side View

0
0
0
1
3
7
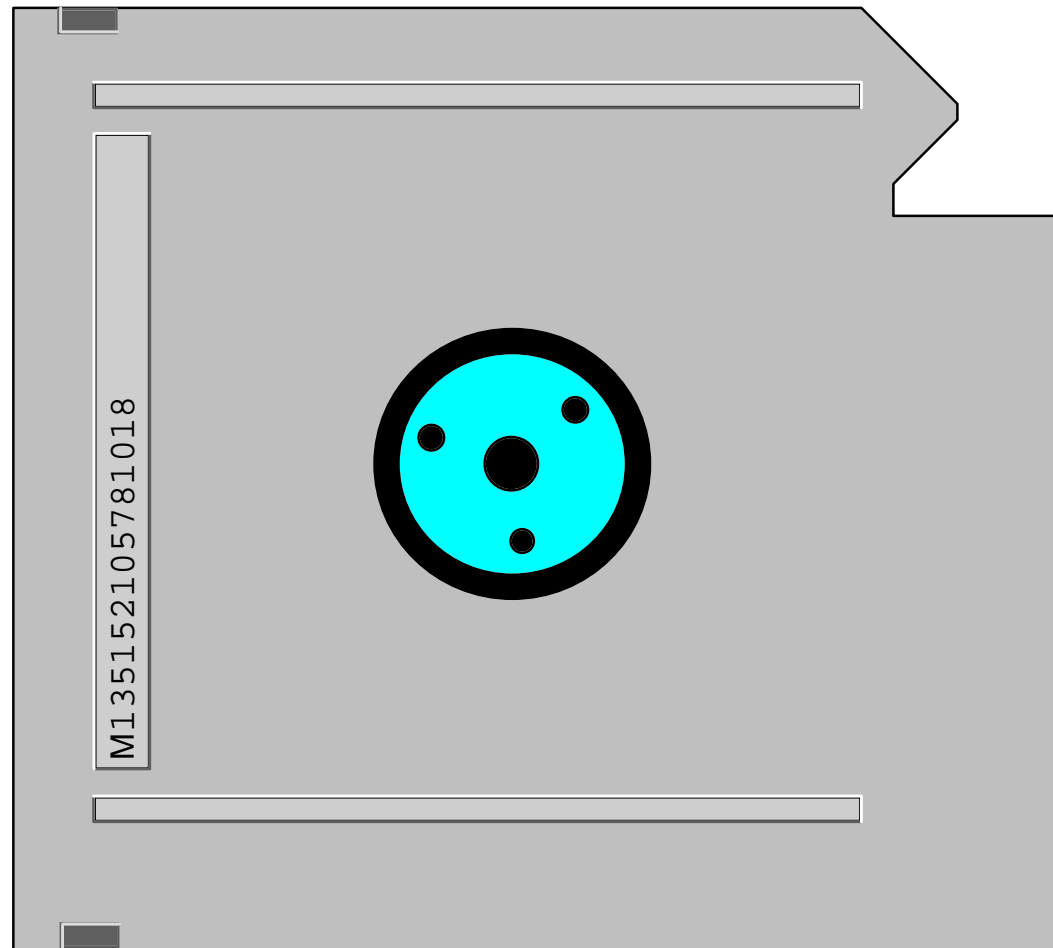
End View with Barcode

EMASS Archive Optical Cartridge

FORMATTED

Verbatim

1024 Bytes/Sector
A Side
VBR5E4
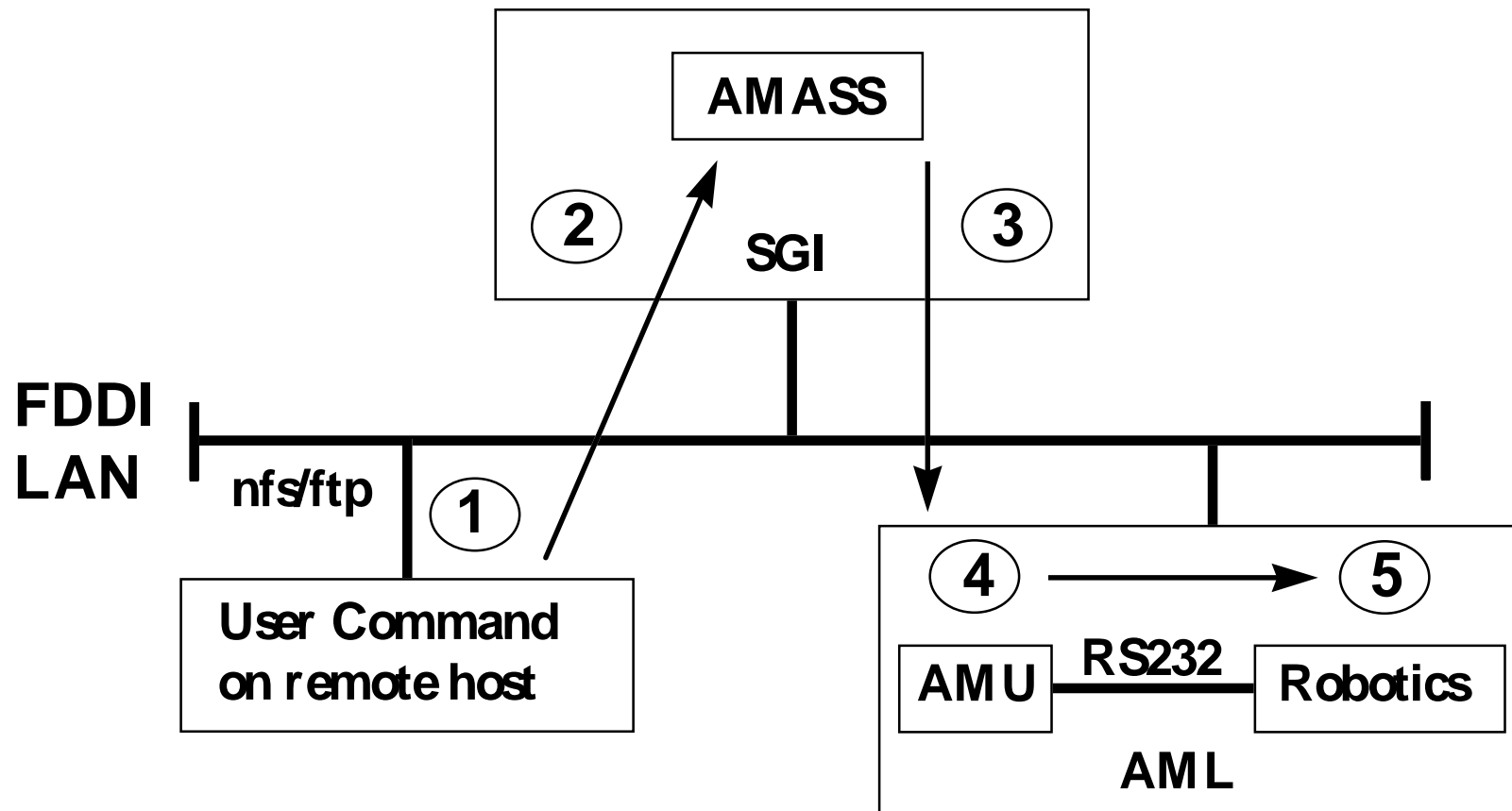
Rewritable
1.3 GB

51005552

0
0
1
5
6
A

B
9
5
1
0
0

End View with
Barcode

STK D-3 Tape Cartridge
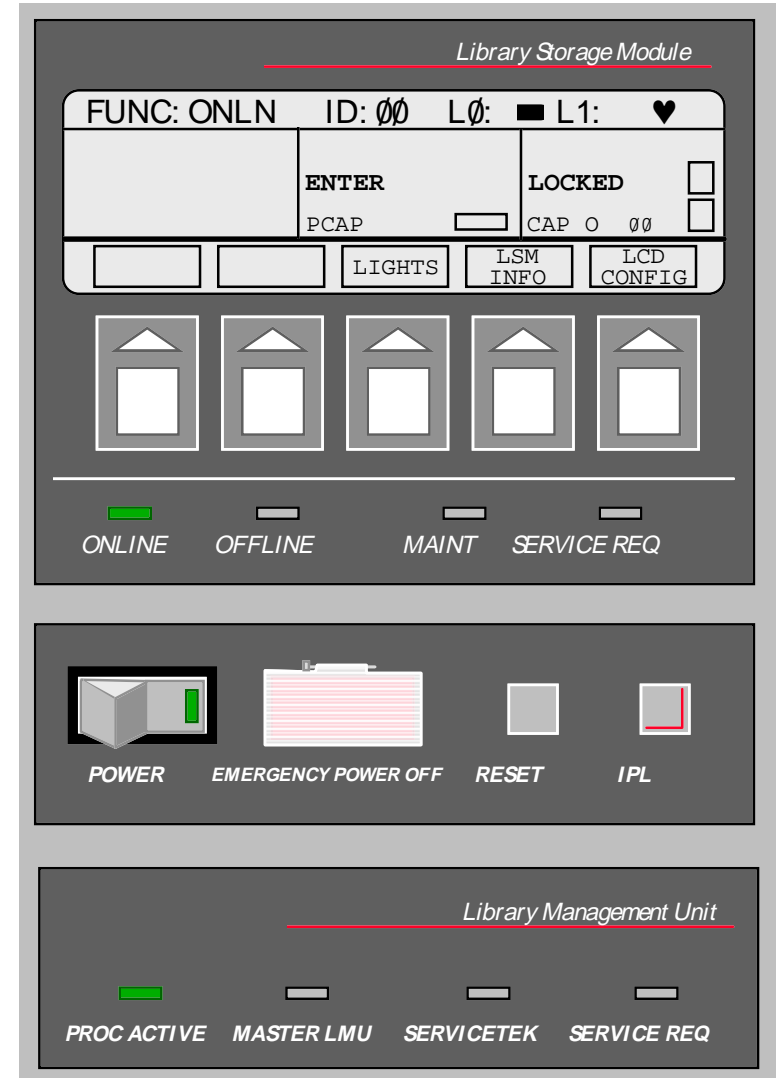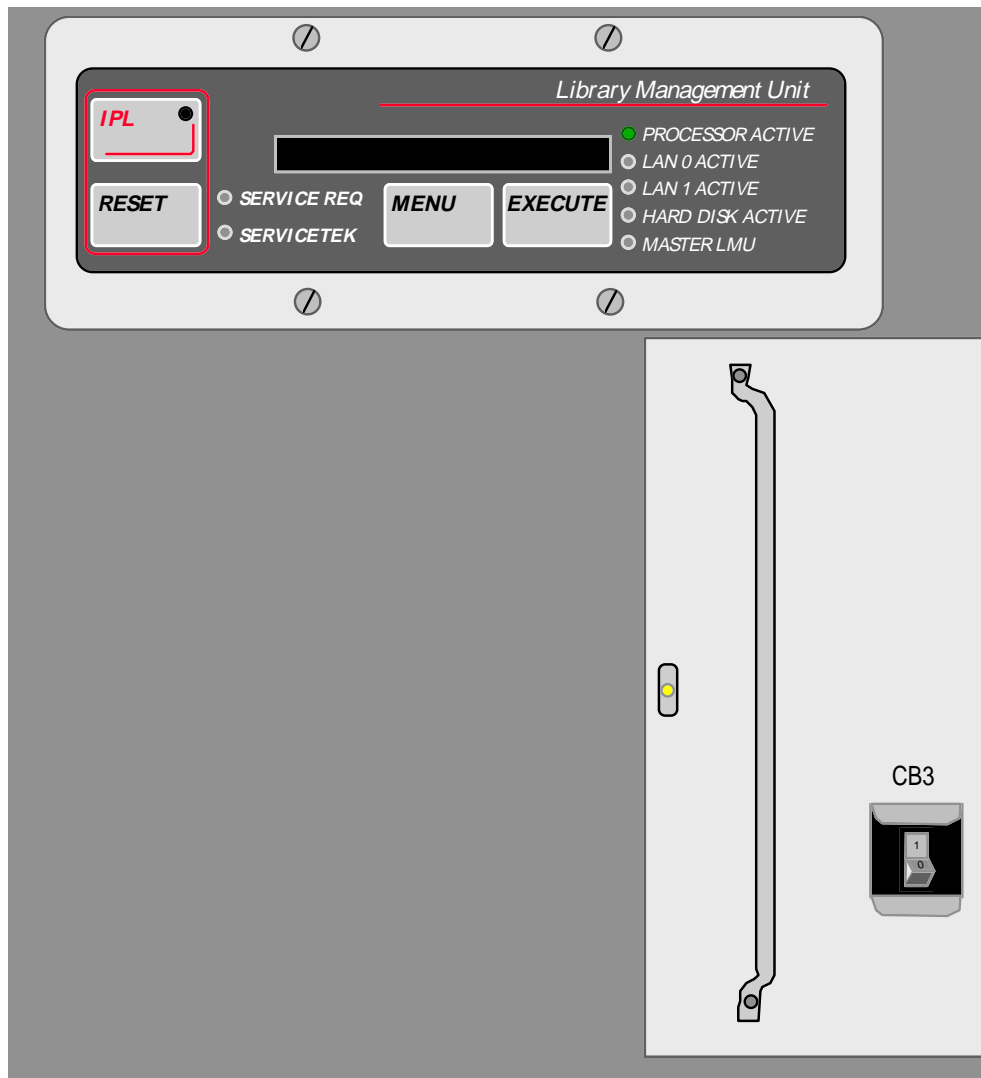

End View with
Barcode

AMASS Control Path

AMASS

② SGI ③

FDDI
LAN

nfs/ftp

①

User Command
on remote host

④ ⑤

AMU RS232 Robotics

AML

Sources and Uses of Archive Data

Other DAACs

Processing Subsystem

Ingest Subsystem

Archive

Authorized Users

EMASS AML Control Panel

AMU Display

AML Main Switch

Plant On Button (green)

Control On Button (green)

Control Off Light (amber)

Emergency Off Knob

main switch
on
off

plant
on

control
on

control
off

operation mode
auto
manual

illumination
on-off

emergency off

Auto/Manual Mode Switch

Illumination On-Off Button

STK Control Panels

Insert Data Into the Archive

Processing Subsystem   Data Server

Initiate the session.

Data Insert Request is queued.

Processing Subsystem   Data Server

Archive Data

Data is Transferred

Advertise the new data!

Store data in permanent archive.

Validate the Metadata

Store metadata in Science Data Server.

14
625-CD-010-001
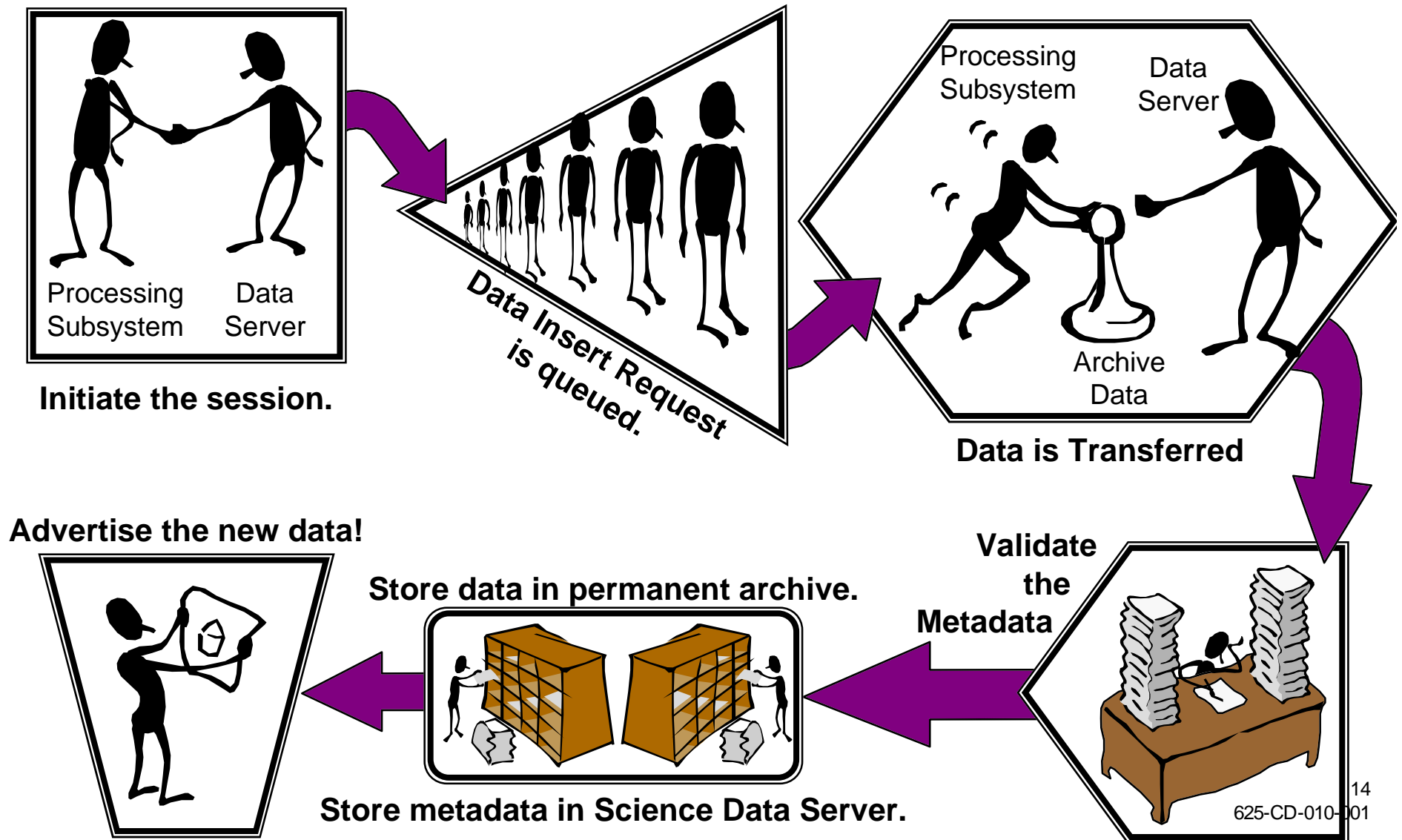
Archive-Related Applications

- **Servers (must be running)**

  - **Science Data Server (SDSRV)**

  - **Storage Management (STMGT) Server**

  - **Staging Disk Server**

  - **Staging Monitor Server**

  - **Archive Server**

  - **Ingest FTP Server**

  - **Distribution FTP Server**

  - **D3 Tape Server**

  - **8mm Tape Stacker Server**

  - **Data Distribution (DDIST) Server**

- **DSS Graphical User Interface (GUI)**

System Management Requests Window

625-CD-010-001

System Management Filter Requests Window

Data Server:
Distribution Requests Window

625-CD-010-001

Distribution Filter Requests Window

Retrieval of Data from the Archive

- **Largely automated process in response to data distribution requests**
  - data orders from scientists or other ECS end users
    - » one-time orders
    - » standing orders placed as subscriptions for acquiring data
  - data requests from other ECS sites
    - » cross-DAAC orders for end users.
    - » data needed as input for processing at other sites (subscriptions placed for ingest by those sites)
  - internal requests for data needed for processing
- **DSS Distrib'n Requests window to monitor**

Loading/Removing Archive Media

- **EMASS AML: Entry Interface Facility (EIF)**
    - **30 Tapes**
    - **22 Optical cartridges**
- **STK Powderhorn: Cartridge Access Port (CAP)**
    - **21 Tapes**
- **Automatic loading (recommended for most loading)**
- **Manual loading (available for initial loading or other bulk loading)**

Archive Backups

- **Programmatic backups are part of design requirements**

  - Active archive copy

  - Local backup storage copy

  - Off-site backup storage copy

- **Selection of data for backup dependent on factors such as feasibility of recovery by other means (e.g., re-ingest, reprocess)**

- **Off-site storage for GDAAC is LDAAC; off-site storage for other DAACs is GDAAC**

Some AMASS Commands

- *vollist*
  - Lists all volumes and current status

- *dirfilelist*
  - lists files under a specified directory

- *volfilelist*
  - lists all files on a specified volume

- Others: See *AMASS System Administrator's Guide, Version 4.9*

Creating a Backup for AMASS

- AMASS tape format is proprietary, designed for speed of access

- *vgexport -q* command creates an ASCII file that can be used with the tapes and *vgimport* command to recover the stored data

Replace Backup Volume (Volume 1)

- AMASS database backup is stored in the archive on Volume 1

- AMASS issues warning when Backup Volume is nearly full (95%)

- When warning message is received, install new Backup Volume and perform a full backup

- If Backup Volume gets full during attempted backup, backup will fail, necessitating replacment and full backup

Manual Backup of Archive Data

- **Necessary when a backup data tape is used and must be replaced**

- **Data restoration using a backup data tape is achieved by inserting the tape into the archive**

- **To replace the tape requires manual creation of a copy**

Restoring Archive

- **Request replacement from data provider**

- **Reprocess lower-level data to obtain lost higher-level product**

- **Use backup tape**

- **If archive storage attempt fails, use *amass_log* script to identify errors and obtain suggested corrective action**

AMASS Utilities and Scripts

- *quedisplay* is a library utility used to view the AMASS queue and diagnose problems

- *amass_log* is a script permitting display of AMASS messages from the system log

- There are other utilities and scripts described in *AMASS System Administrator's Guide, Version 4.9*

Sample Output from *quedisplay*

Record ID

A read request

Record is located on volume 3

```
READQ rid=52696, fptr=0xf0227c5c, vol=3, fnode_flags=0x110
WRITEQ rid=79, fptr=0xc00eff54, vol=5, fnode_flags=0x8048844
ADMINQ:cmd=1, flags=0x6,vol=32, juke=1, pid=1047, ftype=0, err=0
JUKEBOX 1 DRIVE 1, vid=32, vflag=0x100, status=0
JUKEBOX 1 DRIVE 2, no volume in drive
```

A volformat command (cmd=1) was issued on volume 32

Process ID

The last two entries are a list of libraries, drives, and corresponding volume IDs